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### THE NEWER OBSTETRICS\*

PRESIDENTIAL ADDRESS

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AFTER one has been in practice for a considerable time, he is justified in dealing in reminiscences. To me it is most interesting to recall the changes which have taken place in the practice of obstetrics during the time in which it has been my privilege to follow this especial field and to contrast the methods of yesterday with those of today. Along with the great progress in the practice of medicine in general it would seem that obstetrics has to a large extent kept pace. I well recall at the very beginning of my practice a conversation with a former executive of the University, in which he asked, "Is there really anything new to be learned about that extremely old process?" I wondered if I had in fact decided to spend my career in a sterile field. His question undoubtedly reflected the usual attitude toward obstetrics at that time. We frequently heard or read that obstetrics was the most neglected branch of medicine. However, during the period of twenty-five years, the changes in obstetric practice have been so great that the subject could be almost entirely rewritten as concerns procedures.

It is also interesting to note the part taken by our Society in this development, for many of the important innovations were inaugurated by its own members. In the changes which have taken place we find certain new methods, some of which were devised as purely obstetric, and others devised for the general practice of medicine but adopted as

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especially useful in obstetric practice. Many of the procedures advocated during this period were short lived, while others were found to have real worth and have remained in use. Perhaps of greatest importance is the marked change in the general attitude of obstetricians toward the conduct of labor.

It would seem that the most marked feature of present-day obstetrics, is the fact that there is a distinct spirit of activity, of being ever alert to do something to relieve the patient and to safeguard her and her baby from the dangers which are ever associated with labor, as against the older policy so often expressed of letting nature take its course.

Let me mention briefly those developments and innovations which in my opinion have had the greatest influence on obstetric practice, during the approximate period mentioned. There were of course many others and some of these were inaugurated shortly before this period but were not in general use.

Perhaps the most outstanding development in obstetric practice has been the establishment of prenatal care as a definite part of the treatment of the obstetric case and the education of the laity to the extent of practically demanding that kind of observation from the physician. Instead of the patient engaging her physician and perhaps not seeing him again until the time of delivery, we find her going at regular and frequent intervals for observation and examinations, and this to an increasing degree even to general practitioners. The development of the sphygmomanometer had great influence on the development of prenatal care, and proved to furnish the most important method in the early detection of preeclamptic toxemia, and therefore, in the preventive treatment of eclampsia. The beneficial results of prenatal care have been many, but its influence has been outstanding on the control of toxemia. The incidence of eclampsia has been reduced to a surprising extent and while the treatment of eclampsia proper has not changed materially, for its cause and, therefore, its specific treatment are still unknown, it is accompanied by less interruption of pregnancy than formerly and in general the results are somewhat better. Eclampsia, however, still remains the most important problem in obstetrics.

Efforts to treat complications as such, rather than to terminate the pregnancy are noted to a continually increasing extent and are praiseworthy especially as concerns many which are merely incidental to pregnancy. The old tendency to advise interruption of pregnancy as a cure-all for almost any serious complication is giving way to a policy of allowing the pregnancy to continue and endeavoring to correct the complication in more and more instances. Altogether there is far less induction of labor than formerly. Prenatal care has become an intricate and inseparable part of the treatment of the obstetric case.

The development of the technic of blood transfusion has been of inestimable value to obstetric practice and has given the obstetrician the



means of overcoming some of the tragic complications of obstetrics which had previously been somewhat hopeless, for example, placenta previa, ablatio placentae, rupture of the uterus, ectopic pregnancy, postpartum hemorrhages, and hemorrhages in the newborn child, as well as some infections.

The scope of cesarean section has been somewhat broadened and its technic has been markedly improved. There is no doubt that with the enlargement of the field of this operation there has been great abuse and a vast number of needless cesarean sections have been performed. This abuse of cesarean section, however, cannot be attributed to any considerable extent to well trained obstetricians. It is a well known fact that the better trained in obstetrics a physician is, the fewer cesarean sections he finds it necessary to perform. The surgeon untrained in obstetrics and unfamiliar with the complications of labor and lacking the proper judgment and ability necessary to correct such abnormalities often attempts cesarean section as the easiest method for him. A good illustration of this is the performance of cesarean section in cases of occipitoposterior positions where pelvic measurements are good. Apparently this is not an uncommon though an unwarranted procedure. We find, however, that in addition to its use in cases of obstruction, cesarean section has been responsible for improved mortality rates in such cases as placenta previa, ablatio placentae, cardiac cases, and some cases of toxemia.

Undoubtedly no advance in obstetric practice during the past generation stands out as prominently as the treatment of the antepartum hemorrhages by blood transfusion and cesarean section. With the development of abdominal cesarean section certain procedures such as the accouchement forcè, the use of the Bossi dilator, pubiotomy and vaginal cesarean section have either fallen into disuse entirely or into the background. Altogether more consideration has been given to the interests of the unborn child and craniotomy is now seldom performed and almost never on the living child.

The introduction of pituitary extracts has had a real influence upon obstetric practice. When these extracts were first introduced their use was associated with much abuse and much harm was done in attempts thereby forcibly to shorten labor. With the almost universal abandonment of this practice among obstetricians there remained the unquestionable value of pituitary extracts in stimulating uterine contractions after the second stage and in the operation of cesarean section. Their routine use during the third stage of labor and during the immediate postpartum period has been the means of preventing many cases of postpartum hemorrhage.

Altogether greater emphasis has been laid on the scrupulous maintenance of asepsis in its broadest sense. A more general adoption of rubber gloves in obstetric practice has served to greatly improve

aseptic technic and to impress upon the physicians who conduct labors that obstetrics is decidedly a surgical specialty and in their technic they should be even more painstaking than the general surgeon. The introduction of the long-sleeved rubber glove has immensely facilitated the procedure of podalic version and lessened the dangers of infection associated with its performance.

Through the daring and skill of one of our members the podalic version has taken a place in obstetric practice formerly believed unthinkable. It has been definitely proved that podalic version is a far safer procedure than high forceps. Forceps deliveries have been greatly modified by the newer obstetrics. Today forceps are used more frequently than formerly and yet far more safely. With the almost general abandonment of the high forceps operation most forceps deliveries have become comparatively easy and include chiefly either low forceps or the corrective forceps for the rotation of posterior positions to normal ones. The use of prophylactic forceps has become more common and its advocates have been able to show real benefit when proper technic is used. Altogether the performance of both version and forceps deliveries has become characterized by a greater delicacy of maneuver in marked contrast to the strenuous and often brutal efforts formerly seen.

In the relief of pain during labor we note a startling contrast to the older methods. The custom of giving nothing at all for the relief of pain or of giving only a few whiffs of anesthetic as the baby's head is being delivered has become obsolete. Safe methods have been developed whereby the pain of the entire labor may be practically eliminated, and painless or comfortable labor has become an actuality.

Hospitalization of maternity patients has increased to a remarkable extent and it is encouraging to note the greatly increased number of specialized maternity hospitals in this country. The advantages of the isolated maternity pavilion in stimulating the advance of maternity welfare, in the training of obstetricians and in the prevention of infections have been definitely proved. The reduction of the most outstanding cause of maternal mortality in this country, infection, will come through a better realization of the importance of the principle upon which the isolated maternity pavilion is based, namely, that there should be no possible communication between it and any sources of infection. This is an old law but one continually broken both by general practitioners who continue to go from infected cases to confinements, and as regards hospitals in which the maternity ward is so located and the medical and nursing staffs so organized that transmission of infection can scarcely be avoided. Altogether there has been a great revision of obstetric practice and while all the methods mentioned can not be said to be adopted by a very large percentage of obstetricians, they are, with slight modification and in principle at

least, followed by a sufficiently large number to form what may be called the new school of obstetrics.

In the newer obstetrics the patient in labor is given something to relieve pain as soon as she complains or is obviously suffering. Measures for the relief of pain are continued from this time until the completion of labor. In a large percentage of cases the patient awakens with no recollection of the labor, and in all cases she has at least been comfortable. The newer obstetrics countenances neither meddlesome interference nor dilatory negligence when there is a correctible abnormality. As long as there are no serious complications labor is allowed to take its natural course until the time when, in the absence of deviations from the normal mechanism, there should be definite progress. The employment of these relief measures has also resulted in more constant watching of the patient during labor, more frequent observation of the mother's condition and of the fetal heart and an alertness to detect complications which sometimes unexpectedly arise. The nurse anesthetist and the nurse especially trained for the conduct of labor have taken a most important part in the development of this phase of modern obstetrics. Complications of position are corrected early in the second stage that the patient may be saved wasted effort. Prophylactic version and prophylactic forceps are commonly used. Such procedures as routine induction of labor, stimulation of pains by pituitary extracts or any of their modifications, manual dilatation of the cervix to hasten progress, except in extreme urgency, are not recognized as proper.

What is to be the future of this newer obstetrics? Is it destined to be followed by an increasing number of obstetricians as the years go by and is the future development of obstetric practice to be according to the same general policy? There seems to be a feeling of scepticism on the part of many obstetricians who while admitting the advantages to the patient of such methods when properly carried out, doubt the wisdom of approving them because such procedures are not within the capabilities of the profession as a whole. However, there has been a tremendous change in the general attitude of obstetricians toward the conduct of labor. The expressed opinion of members of this society may be taken as an index. Many of us will remember the heated and almost bitter discussions in this Society fifteen or twenty years ago concerning the relief of pain during labor. There was much opposition even to giving anything for the relief of pain and yet today while there may be a difference of opinion as to the merits of individual methods the principle of the relief of pain is almost universally accepted. I well recall being taken to task by a very esteemed member and former president of our society for giving anesthesia during the entire second stage of labor, but today it is granted that the first stage of labor may also be made painless. You will also recall the heated discussions con-

cerning the use of the podalic version and prophylactic forceps. However, these procedures are now accepted as reasonable when proper technic is used and are being adopted by an increasing number of those who are carrying out the principles of the newer obstetrics. If the early advocates of these procedures went a little too far and overstepped the bounds of wisdom, their action may be justified by the ultimate result of establishing the real worth of these methods. The old-fashioned obstetrics was so deeply rooted that it required almost a tornado to uproot it or an earthquake to rattle the old bones of its undying adherents. If there are sins of commission in the new school, they are many times balanced by the sins of omission in the old school. Revolutionists usually go to extremes but the pendulum eventually swings back to establish the changes on a sound basis and the changes in obstetrics amount almost to a revolution.

With the influence of Societies such as this, we need not fear the ultimate results of these rather drastic changes. While in our Society there are those who are impulsive and sometimes seem radical, there are, to balance these, other members who are reluctant to agree to many innovations. There is always a balance of ideas which tends to insure safety, and bring about a more definite standardization of methods. A definite standardization of methods, to be sure, will be most difficult to establish and yet perhaps not impossible. At any rate there can be a standardization of the principles upon which individual methods are based.

If the mortality and morbidity results of the new school of obstetrics were actually as good as those of the older school, there would be much to be said in favor of the former. It would appear, however, that when carried out by the well trained and competent the newer methods show better results than the older. Painless labor and shortened labor are not necessarily synonymous, although both may have merit. It is possible to conduct a painless spontaneous labor; the shortening of the second stage being merely a natural result of the desire to save the patient which is responsible for analgesia and anesthesia. In other words prophylactic delivery is an attempt to relieve the patient of unnecessary physical effort and fatigue as well as mental and nervous strain, but only where conditions are such that this may be done without increased risk to either mother or child. Probably one of the chief reasons for the increasing use of the prophylactic delivery is the realization of the injurious effects on the child of prolonged second stage labor and of the fact that in many instances the welfare of the child is safeguarded by interference.

The contrast between the mental attitude of the women who live in a community where the methods of the new school are carried out as compared with that of women of a generation ago, is striking. As I remember patients of years ago, they had a dread of childbirth which

at times amounted almost to horror as they contemplated what had been impressed upon them from girlhood as a terrible ordeal. They were nervous and apprehensive and had many of the nervous complications of pregnancy which would naturally result from such a state of mind. Contrast this patient with the young woman who has learned from her friends that childbearing is no ordeal, in fact, a practically painless experience and not in the least disagreeable. She looks forward to the confinement with little or no fear but with perfect confidence that she will not suffer. Her pregnancy therefore, is not a period of worry. She is altogether a happier woman and free from the nervous symptoms of the patients earlier seen. Even the nausea and vomiting of early pregnancy is less and pernicious vomiting is rare indeed. The convalescence of such patients is also more rapid and freer from nervous disturbances.

The chief adverse discussion of the newer obstetrics is on the ground that the profession in general can not carry out such methods. This is perfectly true; for physicians untrained in obstetrics have no place in the new school, just as the physician untrained in surgery should not attempt to do major surgery. But this fact should not in any way detract from the development of obstetrics along these lines if it can be shown that those well trained can satisfactorily carry out these procedures. It is encouraging to note the great difference in the training for obstetric practice today as compared with that of a generation ago. When I graduated from medical school and was given a license to practice medicine including obstetrics, my experience amounted to attendance on two cases. One was a false alarm when after spending the night on the floor I went home the next day because the patient was not in labor; and the other was an actual delivery which I did not personally perform. Today in that same school, the Western Reserve University School of Medicine, each student who graduates has attended an average of fifty confinements, in addition to attendance at the prenatal dispensaries and postpartum rounds. Even with this amount of experience such a physician is qualified to conduct only normal labor. Upon graduation from the Medical School the physician should have a knowledge of the normal processes of pregnancy and labor. He should have obtained a satisfactory training and actual experience in the conduct of labor and in the delivery of normal cases, especial emphasis being laid on the strict observance of aseptic technic. Too much stress cannot be laid upon the latter, for the correction of the longstanding casual attitude of those in general practice toward the observance of surgical technic means indeed an uphill fight. The student should gain a thorough understanding of the deviations from the normal with a certain ability to recognize them; and should know that there are definite ways of meeting these complications. Most important of all he should be impressed with his own limitations so that



he will not attempt corrective measures which he has of course not mastered and will be more willing to seek help by consultation without undue delay. The usual tendency has always been for the general practitioner to attempt almost any sort of delivery and to seek help only after failure in his attempt. On this account consultation in obstetric practice has always been most unsatisfactory for the consultant may have little opportunity of accomplishing satisfactory results. Often his chief function is merely that of sharing the responsibility of the doctor in charge. We are not so optimistic as to imagine that all obstetric cases can eventually be cared for by the specialists, but it is at least to be hoped that in addition to those actually under their care a much larger percentage of complicated cases will be seen by them.

It has been suggested that changes in and limitations in licensing may be the solution to this problem, but in all probability it is being solved by the laity who are not slow to recognize and demand better care. We can not entirely ignore the demands of the laity. It is most unfortunate that lay groups have openly demanded a specific form of analgesia, and such should be condemned as dangerous propaganda. However, in condemning this action let us be careful not to overlook the propriety of their demanding relief of some sort in view of the proved success of such methods.

The newer obstetrics is for those who have spent sufficient time in preparation for this specialty. It is noteworthy that the modern trend is for much longer periods of obstetric training. Short services of from four to six months have become fewer and today a common course of training for the specialty is three years. In this connection let me mention the importance of the American Board of Obstetrics and Gynecology, a child of this Society and originally proposed by one of its members. Already, although only a year old, its influence is being felt upon the younger men who are planning their training on the requirements laid down by this Board.

Obstetric practice seems to be gradually coming into the hands of those especially trained. This generation or the next should see a large percentage of obstetric patients in the hospital under the care of specialists and while there may always be localities in which there is not a highly trained obstetrician, this situation is not very different from that of surgery and it is usually possible to secure the services of the surgeon when needed for consultation. Great progress in this direction has already been made. Let me give you an illustration: Twenty-five years ago there was no one in Cleveland who limited his practice entirely to obstetrics, although there were those who were competent in the methods of those days, and there was little hospitalization of patients. Last year (1930) 55.7 per cent of the confinements were in hospitals, and 21 per cent in specialized maternity hospitals. It has been estimated that in the first six months of 1931, 45 per cent

of the babies born in Cleveland were delivered by specialists or under their supervision. The number delivered by midwives has been reduced from 27.8 per cent to 6 per cent during the last ten years. Excluding the University home delivery service, only 30 per cent of the deliveries in Cleveland are in homes.

These rather remarkable figures are indicative of the general trend of obstetric practice and reflect the influence of the newer obstetrics, for it is to a large extent practiced in that community. The newer obstetrics is not radical. On the contrary, its fundamental principles are based on conservatism. Procrastination is not always conservatism and negligence is not sane obstetrics.

The new school of obstetrics, and I use the name with no apology, is without doubt here to stay. It is sound in principle, though of course there will be modification in individual methods to keep pace with progress. It has done much to make obstetrics a definite specialty and depends for its success solely upon the insistence that those who adopt its methods shall have the proper training to carry out its procedures successfully. For those who are not yet in harmony with its methods it would seem that opposition should be replaced by greater thought toward the training of practical obstetricians. Just criticism may be made of the training of obstetricians in some clinics of high rank. In those in which the older methods are used so much emphasis is laid upon the dangers of operative delivery methods, such as forceps and version, that they are performed so infrequently that the men in training do not become thoroughly familiar with the technic and hence do not do them well. It is also a far too common custom for the members of the visiting staff to perform a considerable percentage of such deliveries, further depriving the members of the resident staff of the experience. It would seem that one qualified to be a member of the visiting staff of a maternity hospital should not feel the need of such experience, but would be willing to act in the capacity of a teacher and supervisor of the men in training. Those who perform operative deliveries infrequently can not be expected to become expert in them. Probably in many instances doctors leave a clinic of high rank after a service of several years with a splendid scientific training and a thorough knowledge of the principles of obstetrics but with altogether too little experience in practical delivery methods. There is no doubt that much harm is being done as always before, by untrained physicians attempting delivery methods with which they are not familiar. Without question efforts should be continually made to discourage such practice. In the last analysis the physician who has had only the training in obstetrics which is given in the medical school should limit his practice to normal obstetrics. If he is not sufficiently skilled to perform prophylactic version or prophylactic forceps, he certainly is not qualified to perform forceps deliveries or versions under other

more urgent conditions; for, the prophylactic deliveries are in reality the easiest to perform because they are done under ideal conditions.

The Obstetric Clinic of Western Reserve University, may be taken as an example of the new school. While relief measures are used to the limit of safety, conservatism is in reality its foundation for every procedure is based on the principle of conserving the mother and baby in some respect and harmful interference is not tolerated. The success of these measures has been so thoroughly established that there is no longer an element of experimentation. In that Clinic special stress is laid upon teaching residents in training practical delivery methods and giving them sufficient experience to become expert in performing them. Relief measures to be used comprise only a part of the functions of such a clinic, but nevertheless furnish the chief controversial factor.

In addition to a thorough fundamental and scientific knowledge of obstetrics, the well equipped obstetrician of today should have a humane spirit which will make him ever ready to relieve the suffering of his patient; a conscience which will not allow him to break his aseptic technic even under the most trying conditions and keep him scrupulously careful to avoid all possible sources of infection; obstetric judgment developed by extensive training and experience, which is after all the greatest asset of the obstetrician; and finally the technical skill necessary to perform obstetric operations.

Strange to say I have often been asked what the obstetrician's reward is to be for making labor easy. This must always be a secondary consideration. It cannot be expected that the obstetrician who adopts the methods of the new school will endear himself to the hearts of his patients as did the physician of the old school who sat by his patient through intense suffering, having as his chief armament patience and encouragement and who only as a last resort delivered the baby and ended the ordeal. Appreciation comes mainly by contrast, and prophylaxis never impresses the patient's mind as much as cure. When a patient is carried through a labor in a state of practical oblivion and really has no knowledge of what a genuine labor pain is like, she cannot appreciate the worth of such treatment, as does the patient who is relieved after long suffering. The obstetrician's reward must be largely his personal satisfaction in the realization that he has been able to conduct comfortable and at the same time safe labors and thereby save the women of today the tortures of our mothers.

## A STUDY OF THYROID ACTIVITY IN NORMAL PREGNANCY

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SINCE Magnus Levy (1897) studied the basal metabolism of a pregnant woman, there has been a voluminous literature regarding the role of the thyroid gland in normal pregnancy. According to Seitz the "composite picture of an enlargement of the thyroid gland, the increased iodine content of the blood, the increase in basal metabolism, and the rendering worse, clinically, of hyperthyroids in more than half of the cases, points with definiteness that during pregnancy more thyroxin is produced by the thyroid gland,"<sup>1</sup> Mussey, Plummer, and Boothby,<sup>2</sup> in 1926, and Mussey and Plummer in 1931<sup>3</sup> reported a series of hyperthyroids complicated by pregnancy. These patients were treated for their hyperthyroidism medically, surgically, or with a combined treatment and very favorable results were reported. Therefore, Seitz' conclusions that hyperthyroids are rendered worse during pregnancy can be interpreted for untreated patients only.

In a thorough study of the phase of the problem of the thyroid concerned with the production of thyroid hormone in pregnancy, Anselmino and Hoffman have shown beyond question of doubt that a substance which fulfills all of the prerequisites for thyroxin is present in the blood stream of normal pregnant women. It is the purpose of this paper to review their work and present confirmatory experiments concerning one phase of the problem.

Abelin stated that "for the identification of an unknown substance as thyroid hormone, three different typical thyroid actions must be fulfilled, so that other substances which might give one or another of the thyroid actions may be ruled out." No specific test for the direct determination or demonstration of thyroid hormone is available. Eufinger, Wiesbader and Focsaneanu<sup>4</sup> applied the Reid Hunt reaction as a direct test for the identification of thyroid hormone. The acetonitril, or Reid Hunt, test is based upon the greatly increased resistance of mice to acetonitril injected subcutaneously, when thyroid is administered to them, usually by mouth. The characteristic actions of acetonitril are due to its decomposition products. The most poisonous of these decomposition substances in the body is HCN. The formation of these products is due, apparently, to hydrolysis of the acetonitril molecule, but there are indications that simultaneous processes of oxidation are involved. Thus, in the majority of laboratory animals, with the increased oxidation, i. e., by feeding thyroid, there is a lowered resistance, the toxicity of acetonitril is enhanced, and they die. Mice alone become very resistant to this poison. It is this anomalous reaction of mice to acetonitril which gives the test its value.<sup>5, 6</sup>

Eufinger, Wiesbader and Focsaneanu, therefore, injected mice, under standard condition, with blood serum from pregnant women and concluded that "the acetonitril resistance of white mice was undoubtedly increased by virtue of treatment with

the serum of healthy pregnant women." A gradual strengthening of this positive reaction was noted as pregnancy progressed, arriving at a height prepartum and falling in the puerperium. Cord blood was lethal to mice in much smaller doses than that of the mother, indicating a lesser concentration of hormone. This was considered to be a specific test for thyroid hormone until these same authors (Eufinger and Wiesbader<sup>7</sup>) obtained the Reid Hunt reaction by injecting white male mice with anterior pituitary hormone (Prähormon) and to a lesser degree with ovarian hormone (Hogival). Thus the thyroid specificity of the reaction was questioned. Possibly the original reactions with blood serum were due to pituitary or ovarian hormone. However, the Reid Hunt reaction was not positive for fetal blood and inasmuch as it is known that both pituitary and ovarian hormones are present in equal concentration in maternal and fetal circulation, the test, although not specific, may be considered indicative of the presence of thyroid hormone.

Anselmino and Hoffman,<sup>8</sup> in the first of their publications, demonstrated that the pregnant organism splits considerably more carbohydrate into lactic acid than a nonpregnant one under like conditions. They concluded that this strengthened lactic acid production was referable to an increased thyroid activity. They also noted that patients suffering from Basedow's disease showed an analogous strong lactic acid formation at work and rest.

A constant characteristic of the metabolic activity of the thyroid hormone is an increase in acetone bodies in the hyperthyroid organism. The level of ketone body formations depends on the size of the disposable glycogen store, which, as we know, decreases materially under thyroid activity. Abelin and Jordi demonstrated that thyroid feeding and thyroxin injections into rats resulted in a threefold increase of acetone bodies in the urine. This finding was also noted clinically in hyperthyroid conditions. Porges and Novak observed that withdrawal of carbohydrates in pregnancy resulted in a much higher acetone body level in the urine than in nonpregnant women under like conditions.

Anselmino and Hoffman,<sup>9</sup> therefore, injected a series of rats with serum from pregnant women. Acetone body determinations were made after the method of Engfeld. They concluded that a substance which markedly increased the acetone body production in rats was present in the serum of pregnant women. This substance was demonstrated in the first months of pregnancy, reached its maximum at term, and fell rapidly in the puerperium, being present in very small amounts on the sixth day postpartum. This substance could not be demonstrated in marked concentration in the nonpregnant state. The concentration in fetal blood was much lower than in maternal blood and generally could not be demonstrated at all in the former. This substance was identified as thyroid hormone, and one cubic centimeter at term corresponds to 10  $\gamma$  thyroxin.\*

Numerous authors agree that the basal metabolic rate at term is increased from 10 to 30 per cent above normal. This increase in basal rate has been construed by some to mean an increase in thyroid activity. Anselmino and Hoffman<sup>10</sup> performed another series of experiments in which rats and mice were injected with pregnancy serum and the carbon dioxide production was determined. The technic for these experiments was that of Hoffner and Doederlein. Their results indicated that, uniformly, the CO<sub>2</sub> production and therewith the basal metabolism of those animals treated with pregnancy serum, increased markedly; whereas those injected with normal (nonpregnant) serum showed no change in metabolism. Here again the greatest increase was noted in the last month of pregnancy, with a rapid fall during the puerperium. Fetal blood was inactive, giving no such increase. Ultrafiltration of maternal blood rendered it inactive. Thyroxin caused the same reaction as pregnancy, 1 c.c. of serum at term corresponding to eight to 12  $\gamma$  thyroxin.

\*1  $\gamma$  = 1/1,000,000 gm.



In addition to the above mentioned work, which uniformly demonstrated the presence of thyroid hormone in the blood serum of pregnant women, Anselmino and Hoffman discuss a series of clinical observations which lead to the same conclusions. An increase in the metabolic processes, as is found in the pregnant state, must set up a greater demand on the circulation.<sup>11</sup> There is uniform agreement that the minute volume of the heart is increased in pregnancy, and according to Davies, Meakins, and Sands this increase is in proportion to the increase in metabolism, the two being closely related. Linhard, who studied one patient throughout pregnancy and puerperium, determined that the heart minute volume is highest just before labor, with a subsequent fall in the puerperium. The increase in minute volume is also typical of thyroid activity. The degree of rise in pregnancy is similar to that of the mild forms of Basedow's disease which Zondek and Bansi call "Prä Basedow."

The minute volume can be expressed in the formula  $\frac{\text{Blood Pressure}}{\text{Vessel Resistance}}$ . The blood vessel resistance is indirectly proportional to the vessel cross-section. The blood pressure of healthy pregnant women is not or at least not much increased. The minute volume is undoubtedly increased. Therefore, the vessel resistance must be decreased by opening new arterioles and capillaries or dilatation of those already patent. This widening of the capillary bed is noted not only in the uterus and genitalia, but generally over the body. The radial pulse volume is increased, and Haupt concluded that the capillary cross-section of the arm is increased in pregnancy. Clinical observation of redness and warmth of the skin, etc., bear out these data. In Basedow's disease analogous experimental and clinical observations have been made.

In both pregnancy and hyperthyroid conditions a decreased oxygen consumption has been noted. With an increased minute volume of cardiac output, the amount of oxygen given off in the tissues per unit of circulating blood is decreased. Whereas in the nonpregnant state the blood gives up 30 to 40 per cent of its oxygen in the tissues, in pregnancy and Basedow's disease only 20 to 30 per cent of the oxygen content is released per unit of circulating blood.

When analyzed, all of the data concerning the circulatory changes in healthy pregnant women are analogous to that noted in cases of experimental and pathologic mild hyperthyroidism.

Schoenholz<sup>12</sup> determined that the circulating blood volume at the end of pregnancy is increased some 10 per cent above normal. Zondek and Wislicki found an increase in blood volume of as much as 30 per cent in severe hyperthyroid states.

In studies of the carbohydrate metabolism and the thyroid state, one of the most constant observations is that of a decreased glycogen level in the body following the administration of thyroid. Dresel pointed out that injections of small amounts of serum from patients with Basedow's disease into mice lowered the liver glycogen in the same manner as pure thyroxin, whereas healthy serum caused no such reduction. Anselmino and Hoffman<sup>13</sup> performed a series of similar experiments using pregnant women's serum as the test material. Mice were injected with measured amounts of serum and after a definite lapse of time, the animals were killed and the liver glycogen determined. The liver was prepared by Pfluger's method and the sugar determined by the Hagedorn-Jensen technic.

These experiments indicated that a glycogen-reducing substance was present in the blood serum of pregnant women. Further experiments

also showed that this substance was present in increasing concentration as pregnancy progressed from the second month, and that there was a rapid decline during the puerperium. Another important finding was that the fetal blood caused only one-third as much glycogen reduction as maternal blood. These experiments were considered to be sufficiently important to bear confirmation.

In our series an attempt was made to follow the original qualifications for test animals and technique as closely as possible. Male white mice weighing approximately 20 grams each were used as test animals. These animals were from two separate strains and were labeled Series "A" and Series "B." Further subdivision into units of five mice each was made, each unit for one experiment. The mice were fed a routine ration of bread and water alternating with bread and milk. All animals were fed this measured diet for two weeks before they were used for any experiments. The test material was blood serum taken during the last three weeks of pregnancy or during labor, and the control was serum from nonpregnant women in an intermenstrual phase. The mice were injected subcutaneously in the back five times with 0.5 c.c. of serum each injection. Five mice were so injected for each experiment. Injections were made on the morning and evening of the first and second days and the morning of the third day, at twelve-hour intervals. About twelve hours after the last injection, the mice were killed and sugar determinations were made. A modification of the Pfluger's as described by Olch, Walton and Scrivner<sup>14</sup> was used for preparation of the liver as follows:

1. Five c.c. 60 per cent KOH was measured into a graduated 50 c.c. Pyrex centrifuge tube and balanced on an analytical balance.
2. The five mice of each experiment were killed quickly individually by striking them on the back of the head; the abdomen opened and the liver removed quickly and immersed in the KOH. When the livers of the five of each set were so removed, the centrifuge tube containing five livers was weighed again. The tube was covered and set into a water-bath. Approximately 4.5 to 5.0 gm. of liver was obtained from five mice.
3. The tube containing the livers and KOH was heated in a water-bath for three hours and then
4. Made up to 15 c.c. with distilled water.
5. Two volumes (30 c.c.) of 95 per cent alcohol were added, and the tube allowed to stand over night.
6. The mixture was centrifuged, the alcohol poured off, and the residue (precipitated glycogen) was dissolved in 10 c.c. of water.
7. The alcohol was cooked off by placing the centrifuge tube in a water-bath for 10 minutes.
8. Two volumes of 95 per cent alcohol were added and allowed to stand for two hours.
9. Centrifuged, the alcohol poured off, and 5 c.c. water with one drop of phenol red was added.
10. N/1 HCl was added until neutral. Heated in water-bath ten minutes.

11. An equal volume N/1 HCl was added and the mixture hydrolyzed for three hours in a water-bath.

12. Neutralized with N/1 NaOH and made to 50 c.c. with water.

13. Filtered. Sugar determined by the Shaffer-Hartmann method.

By this procedure the mouse liver glycogen is expressed as glucose in grams per 100 c.c. of blood serum injected.

Our series, thus, also demonstrated the presence of a substance which lowered the level of liver glycogen of the mouse liver. The actual numerical differences between our series and that of Anselmino and Hoffman may possibly be explained by a difference in climate, difference in the strain of animals used and slight differences in technic.

TABLE I. SERIES "A". GLYCOGEN EXPRESSED AS GLUCOSE IN GM. PER CENT.  
EACH FIGURE REPRESENTS ONE EXPERIMENT

CONTROLS (NONINJECTED) gm. per cent	INJECTED WITH NONPREGNANCY SERUM gm. per cent	INJECTED WITH PREGNANCY SERUM gm. per cent
3.160	2.863	2.517
3.810	2.990	0.837
3.742	2.910	2.307
3.600	3.300	0.985
		1.256
		2.752
		2.140
		1.920
3.578 gm. per cent	3.015 gm. per cent	1.851 gm. per cent

TABLE II. SERIES "B". GLYCOGEN EXPRESSED AS GLUCOSE IN GM. PER CENT.  
EACH FIGURE REPRESENTS ONE EXPERIMENT

CONTROLS (NONINJECTED) gm. per cent	INJECTED WITH PREGNANCY SERUM gm. per cent
2.520	0.826
2.660	1.130
2.540	1.220
2.500	1.437
	1.770
	1.130
	1.220
	2.260
	1.470
2.560 gm. per cent	1.384 gm. per cent

TABLE III. RESUME

SERIES	CONTROL gm. per cent	NONPREGNANCY SERUM gm. per cent	REDUCTION PER CENT	PREGNANCY SERUM gm. per cent	REDUCTION PER CENT
A	3.578	3.015	16.0	1.851	45.3
B	2.560	—	—	1.384	45.9
Anselmino and Hoffman	5.07	3.65	26.0	1.40	72.0

Series "A" and Series "B" were of different strains and the experiments with the latter were performed in much warmer weather than with the former. Regardless of these variations, the fact that a markedly lessened glycogen content was noted in the mice injected with pregnancy serum remains as the important finding. Anselmino and Hoffman were able to demonstrate an action with 0.04 to 0.05 mg. of pure thyroxin, similar to that obtained when 2.5 c.c. of pregnancy serum were used. They concluded that the increase in carbohydrate metabolism of the pregnant female, which had, heretofore, been explained on the basis of the needs of the fetus and the growing maternal organs, could be accounted for by an active substance in pregnancy blood serum. This substance could, of itself, influence the carbohydrate metabolism as indicated by their series of experiments which we substantiate. Also, on account of a higher concentration of this substance in the maternal than in the fetal circulation, one may assume that this substance acts as or is attached to a molecule of sufficient size not to pass through the placental membrane and is protein-bound (Goldner). Furthermore, this difference in concentration is not found in the case of the anterior pituitary and ovarian hormones, which are found in the same concentration in maternal and fetal circulation.<sup>15</sup>

A general consideration of symptoms and findings per se makes pregnancy a "hyperthyroid state." The pregnant woman, as distinguished from a Basedow, is in a physiologic condition in which there is hyperfunction of the thyroid. Anselmino and Hoffman in their extensive and thorough study throw new light on the question as to whether the increased metabolism of pregnancy is due to the fetus alone or whether it is due to an increase in the mother's metabolism per se. Certainly they have demonstrated an increased level of thyroid hormone during pregnancy. Also evidence is certain that the level of this hormone is higher in the mother's circulation than in that of the fetus. However, though protein-bound thyroxin in all probability does not pass from the mother to the baby, one is not justified in assuming that such an exchange may not take place from fetus to mother. If the latter condition were possible, the level of increase noted could just about be accounted for by the mother's own thyroid hormone plus that of the fetus. Murlin<sup>16</sup> concluded that "the energy production near the end of pregnancy is nearly equal to the energy requirement of the newborn, according to Rubner's law of skin area." Sandiford and Wheeler<sup>17</sup> concluded that there is "a definite increase in the total heat production during the latter part of pregnancy . . . but that the rate of metabolism of a unit mass of the mother's tissue undergoes no material change, and that the increase in the total heat production may be accounted for by the increase in the amount of active protoplasmic tissue, which is composed chiefly of the fetus, with a small amount of new and accessory tissue of the mother."

P. Winfield<sup>18</sup> observed that "... the calorie consumption at the end of pregnancy is 25 per cent higher per hour per kilo, than at the beginning of pregnancy. This raised metabolism probably takes place in the mother as there is no evidence that the metabolism of the fetus is greater than that of the mother." Schwarz and Drabkin<sup>19</sup> feel that "there is actually some evidence of an increased energy production of the mother during pregnancy."

#### SUMMARY

Our results demonstrate conclusively, as do those of Anselmino and Hoffman, that a substance which lowers the level of mouse liver glycogen, is present in the blood serum of pregnant women. This glycogen reduction indicates an increased level of thyroid hormone in the test material (pregnancy serum) injected.

The evidence seems to indicate that this increase in thyroid hormone is due to an actual physiological hyperfunction of the thyroid gland of the mother during pregnancy.

I wish to thank Dr. Otto H. Schwarz for the privilege of presenting this paper and his many helpful suggestions in this work.

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(For discussion, see page 283.)



## A CONSIDERATION OF CESAREAN SECTION, WITH A SURVEY OF 1047 CASES IN THE CLEVELAND REGISTRATION AREA IN FIVE YEARS

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THE courtesy shown by the hospitals of Cleveland in giving assistance in the survey was most gratifying. Only two failed to cooperate. All of the cases shown in our statistics were given personal study by one of us. It became apparent as the study progressed that figures alone cannot explain all the variations in results or in the percentages of sections made. In some institutions it is quite evident that injudicious selection of cases was responsible for poor results. In one or two with high mortalities, circumstances are such that the patients coming to the hospital are poor risks. The responsible heads of some hospitals decline operative risks which others accept in the interest of the patient.

Evaluation of these conditions is largely based upon personal judgment but the factors involved are very real and do modify any possible statistics. For these reasons as well as because we are indebted to the hospitals for their courtesy in facilitating our work, we have designated each institution by letter rather than by name.

We have made no attempt to tabulate obstructed labors complicated by other pathology, because the conditions become so complex that figures are of little value.

Cases in which the baby weighed less than 1500 gm. or in which the pregnancy was obviously of less than thirty weeks' duration have been discarded.

There have recently been published a number of more or less complete community surveys of cesarean section. Thompson for Los Angeles, Gordon for Brooklyn, Welz for Detroit, and Miller for New Orleans have made valuable studies. We have quoted freely from their statistics and our indebtedness is hereby acknowledged.

As shown in Table I there were during five years, 92,117 deliveries in the area studied. Of these 45,650 occurred in the 18 reporting hospitals. There were 1047 cesarean sections performed with 75 maternal deaths or 7.15 per cent, one death in 608 deliveries, and a cesarean section incidence of 1 to 44. Comparison of this survey with those of Los Angeles and Brooklyn is shown in Table II.

Other writers have shown what our figures confirm, namely that small hospitals have consistently a mortality rate considerably greater than do the larger maternity hospitals. It would seem that the true figure for each of the three communities is approximately a 7 per cent death rate for cesarean section for all indications and by all methods.

Seven of the 18 hospitals did more than 3000 deliveries each during five years. Table III includes 823 cesarean sections with 54 deaths, or 6.5 per cent. In the 11 remaining hospitals, 224 cesarean sections were done with 21 deaths or 9.4 per cent. (Table III.) Grouping the 18 hospitals according to the number of sections done, Group A, having more than 100 sections each, did 678 cesarean sections with 33 deaths or 4.8

TABLE I. STATISTICS FOR CLEVELAND 1926 TO 1930 INCLUSIVE

HOSPITAL	NO. DELIVERIES	NO. CESAREAN SECTIONS	INCIDENCE CESAREAN SECTION	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	CESAREAN SECTION DEATHS TO NO. DELIVERIES	
A	5 yr.—2958	303	1 to 33	18	5.94	1 to 553	
B	5 yr.—7190	106	1 to 67	4	3.7	1 to 1797	
C	5 yr.—4015	40	1 to 100	5	12.5	1 to 803	
D	5 yr.—3900	52	1 to 75	6	11.5	1 to 650	
E	5 yr.—3899	53	1 to 73	10	18.8	1 to 389	
F	5 yr.—3770	154	1 to 24	3	2	1 to 1260	
G	5 yr.—3049	115	1 to 27	8	7	1 to 381	
H	5 yr.—1984	21	1 to 94	2	9.5	1 to 992	
I	5 yr.—1923	64	1 to 30	9	14	1 to 214	
J	5 yr.—1782	15	1 to 119	1	6.6	1 to 1782	
K	3 yr.—1274	19	1 to 67	0	0	0	
L	5 yr.—1071	48	1 to 22	4	8.3	1 to 268	
M	5 yr.—927	23	1 to 40	2	8.7	1 to 464	
N	5 yr.—467	6	1 to 78	1	16.6	1 to 467	→ no charts
O	4 yr.—224	8	1 to 28	1	12.5	1 to 224	
P	5 yr.—201	7	1 to 29	1	14	1 to 201	
Q	5 yr.—276	13	1 to 21	0	0	0	→ no charts
R	1 yr.—40	0	0	0	0	0	→ no charts
Total Reporting Hosp.	45,650	1047	1 to 44	75	7.15		
Total Area Del.	92,117		1 to 90	2			
S	not obtainable			4			
T	not obtainable			—			
				81	→ 1 to 1014 Del. in total area		

Delivery and cesarean section statistics in 18 reporting hospitals in Cleveland registration area in 5 years. Two were nonreporting hospitals. Deliveries and deaths checked at health office.

per cent, while Group B averaged 26 sections each, doing a total of 369 cesarean sections with 42 deaths or 11.4 per cent. (Table IV.)

TABLE II. CESAREAN SECTION. TOTAL MORTALITY OF THREE SURVEYS

CITY	NO. CESAREAN SECTIONS	NO. DEATHS	MATERNAL MORTALITY PER CENT
Cleveland	1047	75	7.15
Brooklyn	1805	128	7.
Los Angeles	1550	73	5.1 Small Hosp. omitted
Totals	4402	276	About 7

Twenty-five or thirty years ago the mortality of this operation was so high, 20 to 30 per cent, that when we thought of cesarean section the paramount risk which we had to consider was that of the operation *per se*. Because of the grave prognosis, the procedure was rarely carried out except for hopelessly obstructed labor. With gradually increasing knowledge of the conditions requisite for safety, the operative mortality decreased and with this improvement came widely extended indications for the operation. The desirability of this increased use of cesarean section has been vigorously disputed by some writers, because the mortality rate of cesarean section is raised and the total number of cesarean section deaths increased. Such statements are unwarranted unless accompanied by evidence that some other treatment of the existing pathology gives as good results. Lowering of total maternal mortality is our purpose, not protection of the statistics of some operation.

The basic or purely operative mortality of cesarean section must be computed upon a basis which excludes deaths from dangerous conditions already threatening the patient's life, and from which she may die no matter how treated. The moment other pathologic entities: cardiac disease, nephritis, infection, etc., appear in the picture precedent to the cesarean section, that moment the statistics contain both cesarean operative deaths and deaths from the already existing pathology. We therefore undertook first a study of the basic operative mortality of cesarean section.

Among the hospitals studied there were four, A, B, F, G, in each of which more than 100 cesarean sections were done during the five years. In none of the other hospitals were these figures approached. For this, and for other reasons such as reliable detailed records etc., we chose the cases in this group as the basis for a study of the operative mortality. To this end we selected all of the cases in which labor had not lasted longer than twelve hours and in which no important pathology existed except some type of mechanical obstruction. (Table V.)

There were 322 cesarean sections on such patients with six deaths, a mortality rate of 1.86 per cent. These may fairly be called operative cesarean deaths. We have shown elsewhere that in Cleveland the mortality rate of low cesarean section is less than half that of the classical procedure. We therefore believe it may be stated that the basic opera-

TABLE III. LARGE VERSUS SMALL HOSPITALS. SEVEN HOSPITALS WITH MORE THAN 3000 DELIVERIES EACH IN THE FIVE-YEAR PERIOD

HOSPITAL	NO. DE- LIVERIES	NO. CESAREAN SECTIONS	CESAREAN SECTION INCIDENCE	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	CESAREAN SECTION DEATHS TO NO. OF DELIVERIES	REMAINING 11 HOSP.
A	9958	303	1 to 33	18	5.94	1 to 553	Del. by Ces. 224
B	7190	106	1 to 67	4	3.7	1 to 1797	Mat. Deaths 21
C	4015	40	1 to 100	5	12.5	1 to 803	Rate 9.4%
D	3900	52	1 to 75	6	11.5	1 to 650	
E	3899	53	1 to 73	10	18.8	1 to 389	
F	3770	154	1 to 24	3	2	1 to 1360	
G	3049	115	1 to 27	8	7	1 to 381	
Totals	35,781	823	1 to 43.5	54	6.5	1 to 662	

tive mortality for Cleveland is in the neighborhood of 2 per cent for the classical and 1 per cent for the cervical operation.

Cervical cesarean section is frequently chosen for potentially infected cases, and should, other things being equal, show a higher mortality than the average. Our records show that the mortality from the cervical operation is less in Cleveland than one-half that of the classical. (Table VI.)

Nine hospitals reported cervical cesarean sections. The totals of these hospitals were 827 classical operations, 63 deaths or 7.6 per cent and 108 cervical, 3 deaths or 2.8 per cent. The four hospitals of Group A make a better showing but emphasize the superiority of the cervical operation. (Table VII.)

TABLE IV. LARGE VERSUS SMALL HOSPITAL

GROUP "A"				GROUP "B"			
HOSPITALS DOING MORE THAN 100 CESAREAN SECTIONS EACH				14 REMAINING HOSPITALS AVERAGING 16 CESAREAN SECTIONS EACH			
HOSPITAL	CESAREAN SECTIONS	DEATHS	RATE PER CENT	HOSPITAL	CESAREAN SECTIONS	DEATHS	RATE PER CENT
A	303	18	5.94	14 Hospitals	369	42	11.4
B	106	4	3.7				
F	154	3	2.				
G	115	8	7.				
Totals	678	33	4.8				

TABLE V. OPERATIVE OR BASIC CESAREAN MORTALITY

	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	RATE PER CENT
Totals	678	322	6	1.86

TABLE VI. CERVICAL VERSUS CLASSICAL SECTION

HOSPITAL	CLASSICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE PER CENT	LOW CERVICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE PER CENT	TOTAL CESAREAN SECTIONS
A	280	18		23	0		303
B	104	4		2	0		106
C	35	3		5	1		40
D	47	6		5	0		52
E	49	10		4	0		53
F	108	2		46	1		154
G	95	7		20	1		115
H	63	9		1	0		64
I	46	4		2	0		48
Totals	827	63	7.6	108	3	2.8	935

The hospital having highest percentage of cervical operations also had the lowest total cesarean section mortality, 2 per cent.



Table VIII shows tabulations of recent reports of the two procedures. The selections were made to avoid duplications and we think are representative in character. These figures showing 5.2 per cent mortality in 3468 classical and 2.5 per cent mortality in 2753 cervical operations, are rather convincing and the numbers are sufficiently large to be impressive.

We think of the Porro operation as a cesarean section followed by removal instead of suture of the uterus. We have therefore included these cases in our figures. (Table IX.) There were 22 Porro operations with 3 maternal deaths giving a mortality of 13.6 per cent. In two of

TABLE VII. CLASSICAL VERSUS CERVICAL CESAREAN SECTION  
GROUP A HOSPITALS WITH OVER 100 CESAREAN SECTIONS EACH

HOSPITAL	CLASSICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE	CERVICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE
A	280	18		23	0	
B	104	4		2	0	
F	108	2		46	1	
G	95	7		20	1	
Totals	587	31	5.3%	91	2	2.2%

TABLE VIII. CLASSICAL VERSUS CERVICAL CESAREAN SECTION  
RECENT REPORTS OF SURVEYS AND HOSPITALS

	CLASSICAL CESAREAN SECTIONS	DEATHS	RATE PER CENT	CERVICAL CESAREAN SECTIONS	DEATHS	RATE PER CENT
Cleveland	827	63	7.6	108	3	2.8
Los Angeles	1060	44	4.1	262	13	4.9
Evanston Hosp. Reported by Danforth	57	3	5.2	124	1	0.8
Michael Reese Hosp. Reported by Baer				99	1	1.
Chicago Lying-In Hosp. Reported by Greenhill	147	7	4.76	874	11	1.26
Phaneuf				358	15	4.
C. Jeff Miller				790	23	3.
Quigley	104	2	1.92	61	0	0
N. Y. Nursery and Child's Hosp. Reported by Hawks	492	21	4.3	30	0	0
Jewish Hosp. Brooklyn Reported by Daichman and Ronsheim	529	16	3	36	2	5.5
Philadelphia Lying-In Hospital Reported by Lull	109	7	6.4			
Detroit Survey Weitz	143	19	13.3	11	1	9.
Totals	3468	182	5.2	2753	70	2.5

Cervical section mortality averages less than one-half that of the classical section.

these cases the patients had been in labor more than twenty-four hours, were frankly septic when operated upon, and the septicemia went on to a fatal outcome. The third case was brought to the hospital with a history of repeated hemorrhages. Attempts at delivery outside had produced severe cervical lacerations. A Porro operation was done and cellulitis, pelvic abscess and cerebral embolism ensued.

TABLE IX. PORRO SECTION IN CLEVELAND FOR FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. PORRO OPERATIONS	MATERNAL DEATHS
B	106	1	0
C	40	1	0
F	154	2	0
G	115	17	2
H	21	1	1
Totals		22	3

Maternal death rate 13.6 per cent.

We discovered six attempts to save the baby after the mother's death. Several of these were classified as cesarean deaths at the Health Department office. It is interesting to learn that in five of these the cause of maternal death was eclampsia and that in none of these did the baby live. One anesthesia death was followed promptly by section and the baby survived.

#### INDICATIONS FOR CESAREAN SECTION

We have grouped the common indications for cesarean section as follows:

1. Mechanical obstruction
2. Previous cesarean for any cause
3. The hemorrhages of late pregnancy
4. The toxemias of late pregnancy

These mortalities must be studied by comparison with the results of other methods of treating the same conditions. Whether the treatment of ablatio placentae by cesarean section raises the mortality rate of the operation, is not important. Whether it raises or lowers the mortality rate of ablatio is the question.

#### 1. MECHANICAL OBSTRUCTION

We have already discussed mechanical obstruction (uncomplicated). Mechanical obstruction complicated with such conditions as prolonged labor, frank infection, accompanying cardiac or kidney lesions, we have not tabulated because the relative importance of the various complications is so varied as to render tabulations of little value. As stated our estimate of the mortality of simple obstruction is 2 per cent for the classical and 1 per cent for the cervical operation.

## 2. PREVIOUS CESAREAN SECTION

Cesarean section after previous cesarean for any cause. (Table X.)

TABLE X. CESAREAN SECTION AFTER CESAREAN SECTION FOR ANY CAUSE  
CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	INCIDENCE	MATERNAL DEATHS	RATE PER CENT	TOTAL DEATHS	RATE PER CENT
A	303	74	1 to 4	4		4	
B	106	23	1 to 5	0		0	
C	40	4	1 to 10	1		0	
D	52	9	1 to 6	0		0	
E	53	7	1 to 8	1		0	
F	154	33	1 to 5	0		3	
G	115	25	1 to 4½	1		1	
H	21	2	1 to 10	0		1	
I	64	9	1 to 7	0		1	
J	15	2	1 to 7½	1		0	
L	48	6	1 to 8	0		0	
Totals	971	194	1 to 5	8	4	10	5

Three of the maternal deaths occurred after rupture of old cesarean section scars. One developed intestinal obstruction from adhesions found at second operation. Primary death rate same as for mechanical obstruction, viz., 2 per cent.

TABLE XI. REPEATED SECTION AFTER CESAREAN FOR ANY CAUSE

CITY	NO. CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	194	8	4
Los Angeles	197	8	4
Brooklyn	130	1	0.77
Totals	521	17	3¼

Our series shows for Cleveland 194 cases following one or more previous sections for all causes. There were 8 maternal deaths or 4 per cent + mortality. A priori one might think that this class of case would show mortalities in about the same proportion as that of simple obstructed labor. However, 3 of these deaths occurred in connection with a rupture of the uterus in the old cesarean section scar. One developed intestinal obstruction, probably closely related to dense adhesions found at the second operation. One was a syphilitic patient who had previously had four cesarean sections and died of postpartum hemorrhage probably the result of syphilitic changes in the myometrium.

The true operative death rate therefore corresponds closely to that of uncomplicated obstruction, and confirms our estimate of 1 to 2 per cent operative deaths for cesarean section.

Four of these eight deaths were clearly the result of conditions caused by the previous operations. These four deaths should be classified under the heading, "late or delayed mortality of cesarean section." In this

series it equals the primary basic or operative mortality of 2 per cent. Viewed from this standpoint the true mortality of cesarean section is 4 per cent.

These deaths emphasize the necessity for the operator, who is considering pelvic *versus* abdominal delivery in a young woman, to weigh carefully the late or delayed mortality of the operation.

### 3. HEMORRHAGES OF LATE PREGNANCY

*Placenta Previa.*—A. H. Bill last year presented reports from 4 large clinics including his own with a total of 262 cases, treated chiefly by cesarean section, with a maternal mortality of only 1.78 per cent. Bill stressed the value of transfusion preceding or during the operation. In

TABLE XII. CESAREAN FOR PLACENTA PREVIA CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	FETAL DEATHS	MATERNAL DEATH RATE PER CENT	FETAL DEATH RATE PER CENT
A	303	57	2	12	3.5	21.+
B	106	3	0	0	0	0
C	40	7	0	0	0	0
D	52	10	2	3	20.	33.+
E	53	11	1	3	9.1+	27.+
F	154	8	0	3	0	37.5
G	115	22	1	6	4.5+	27.+
H	21	5	0	1	0	20.
I	64	9	1	1	11.+	11.+
J	15	1	0	1	0	100.
L	48	4	0	1	0	25.
Totals	971	137	7	31	5	22.5

Cases 137. Maternal deaths 7. Maternal death rate 5 per cent. Total deaths 31. Total death rate 22.5 per cent.

TABLE XIII. CESAREAN SECTION FOR PLACENTA PREVIA  
CLEVELAND HOSPITALS SEPARATED INTO GROUP "A" AND "B"

GROUP A MORE THAN 100 SECTIONS EACH				GROUP B ALL OTHER HOSPITALS DOING SECTIONS FOR PLACENTA PREVIA			
HOSPITAL	NO. CASES	MATERNAL DEATHS	RATE PER CENT	HOSPITAL	NO. CASES	MATERNAL DEATHS	RATE PER CENT
A	57	?		C	7	0	?
B	3	?		D	10	2	?
F	8	?		E	11	1	?
G	22	?		H	5	0	?
				I	9	1	?
				J	1	0	?
				L	4	0	?
Totals	90	3	3 1/3		47	4	8.9

Most of the series of placenta previa cases reported in the literature are from large clinics and should be compared with our Group "A." 3 1/3 per cent should therefore be compared to 9 per cent as shown for other methods of treatment.

the same presentation he collected a series of 2117 cases, all recent, and reported by competent operators with large clinics, in which version or bags were chiefly used. This series showed a mortality of 9.68 per cent.

Our Cleveland survey shows a 5 per cent cesarean section death rate for placenta previa in all hospitals large and small. (See Table XII.) Separating into Groups A and B, we find Group A hospitals with more than 100 cesarean sections, each had a maternal mortality of only 3 1/3 per cent, while Group B including all other hospitals doing cesarean section for placenta previa had 8.9 per cent of deaths. (Table XIII.)

The three general surveys show an average maternal death rate for placenta previa of 6 per cent. The mortality rates for the three com-

TABLE XIV. CESAREAN SECTION FOR PLACENTA PREVIA  
THREE SURVEYS

CITY	CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	137	7	5
Brooklyn	98	7	7
Los Angeles	68	4	6
Totals	303	18	6

Note how closely the three community figures correspond.

TABLE XV. CESAREAN SECTION FOR ABLATIO PLACENTAE  
CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	RATE PER CENT	FETAL DEATHS	RATE PER CENT
A	303	10	1	10	5	50
B	106	2	0	0	0	0
C	40	1	0	0	1	100
E	53	2	0	0	0	0
F	154	5	0	0	2	37.5
G	115	7	0	0	2	28.5
H	21	3	0	0	1	33.3
Totals	972	30	1	3 1/3	11	37

munities are consistently close together and probably represent the general average. We must emphasize, however, that this is an average rate for hospitals large and small with services both good and not so good. (Table XIV.)

This of course does not represent the best that can be done for placenta previa with cesarean section. As shown above, our four hospitals in Group A had only 3 1/3 per cent maternal deaths. We concur in Bill's conclusion that cesarean section is the best treatment for placenta previa unless the cervix is well dilated.



We wish again to point out that although the increasing use of cesarean section for placenta previa produces a rise in the death rate of the operation, it nevertheless means an actual reduction in total maternal and fetal mortality and is therefore a conservative procedure.

*Ablatio Placentae.*—The total number of cases of ablatio placentae found in our Cleveland series was thirty with one maternal death, 3 1/3 per cent. (Table XV.) Thompson reported from Los Angeles 25 cases with 2 deaths, while Gordon in his Brooklyn report found 19 cases with no deaths. (Table XVI.)

TABLE XVI. CESAREAN SECTION FOR ABLATIO PLACENTAE: 3 SURVEYS

CITY	CASES ABLATIO PLACENTAE	MATERNAL DEATHS	RATE PER CENT
Cleveland	30	1	3 1/3
Brooklyn	19	0	0
Los Angeles	25	2	8
Totals	74	3	4

Maternal death rate surprisingly low.

The three surveys show a total of 74 cases of ablatio treated by cesarean section with three maternal deaths or 4 per cent. The one fatal case in the Cleveland group was in grave condition from hemorrhage when admitted to the hospital.

Polak reported last year 16 cases of ablatio with only one cesarean section and only one death which followed manual dilatation and version with rupture. He rather favors expectant treatment. His figures are good, but it is to be remembered that his report is from one clinic, well organized and with excellent supervision, while the data in our survey are taken from all the hospitals of the community. We think the evidence still favors cesarean section for this condition unless the patient will deliver or can easily be delivered without delay. We concur in his opinion that the value of transfusion for these cases should be emphasized.

#### 4. TOXEMIAS OF LATE PREGNANCY

*Eclampsia.*—Cesarean section is not a popular treatment for eclampsia in Cleveland, and a detailed inspection of the charts year by year shows that its frequency is diminishing.

There were 45 eclampsia cases so treated in five years in Cleveland in all of the reporting hospitals. The outcome was fatal in 9 cases, giving a mortality rate of 20 per cent. (Table XVII.) Comparing this with the two other surveys, we find Los Angeles with 46 cases and 13 deaths or 28 per cent and Brooklyn with 104 and 27 deaths or 26 per cent. The total figures of the three surveys show 195 cases of eclampsia treated by cesarean section with 49 deaths or a total mortality of 25 per cent. (Table XVIII.)

These figures merely confirm many previous reports in recent years showing that this operation does not cure eclampsia. Surprisingly enough, our rate of 25 per cent is the same as that reported by Peterson many years ago in a group of 500 cases collected from the literature.

TABLE XVII. CLEVELAND ECLAMPSIA CESAREAN SECTIONS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES ECLAMPSIA	CESAREAN SECTION INCIDENCE OF ECLAMPSIA	PER CENT RATE ECLAMPSIA	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	FETAL DEATHS	PER CENT FETAL DEATHS
A	303	9	1 to 34	3.	1	11	2	22.
B	106	2	1 to 53	1.8	0	0	0	0
C	40	1	1 to 40	2.5	1	100	1	100.
D	52	3	1 to 17	6.	0	0	0	0
E	53	9	1 to 6	17.	2	22	0	0
F	154	7	1 to 22	4.5	2	28	1	14.3
G	115	2	1 to 57	1.7	0	0	1	50.
H	21	5	1 to 4	25.	1	20	2	40.
I	64	6	1 to 10	10.	2	33 $\frac{1}{3}$	3	50.
J	15	1	1 to 15	6 $\frac{2}{3}$	0	0	0	0
Totals	923	45	1 to 20	5.	9	20	10	22.

Eleven Hospitals doing 423 sections, 43 were for eclampsia. Maternal deaths in eclampsia cases 9. Maternal death rate for eclampsia 20 per cent. Fetal death rate in eclampsia 22 per cent.

Detailed study of the records shows that usually these cases go steadily onward to an eclampsia death, unrelieved by the operation. Apparently the interruption of the pregnancy (the underlying cause of eclampsia) does not compensate for the cessation of vigorous eliminative treatment, necessitated by a laparotomy.

TABLE XVIII. CESAREAN SECTION FOR ECLAMPSIA: 3 SURVEYS

CITY	CASES	DEATHS	DEATH RATE PER CENT
Cleveland	45	9	20
Brooklyn	104	27	26
Los Angeles	46	13	28
Totals	195	49	25

Death rate of cesarean section after convulsions (eclampsia) is four times that of the same operation before convulsions. (See Table XIX.)

Probably the deleterious effect of general anesthesia is a large factor in producing such poor results. However, in our two fatal cases spinal anesthesia was used with no better outcome. The Chicago Lying-In Hospital reports 16 cases with only one death. This is better, but the number of cases is too small to permit of any conclusions. For the present the evidence is strong that delivery by laparotomy must go, as did accouchement forcé, in cases where convulsions have already occurred.

## PREECLAMPTIC TOXEMIA

We have made no attempt to separate into the various types, the toxemias of late pregnancy whose terminal phase is convulsions, but have designated all of them under the old term of preeclamptic toxemia.

We found an entirely different prognosis for preeclampsia treated by cesarean section, in our Cleveland survey, and the results of the 3 surveys are in complete accord. (Tables XIX and XX.)

TABLE XIX. CESAREAN FOR PREECLAMPTIC TOXEMIA  
CLEVELAND FIVE YEARS

HOSPITAL	SECTIONS	NO. TOXEMIAS	RATE PER CENT	MATERNAL DEATHS	RATE PER CENT	FETAL DEATHS	RATE PER CENT
A	303	24	8.	2	8	2	8 1/3
B	106	6	5.5	0	0	1	16
C	40	3	7.5	0	0	1	33
D	52	5	10.	0	0	1	20
E	53	6	11.5	1	17	1	17
F	154	9	6.	0	0	2	22
G	115	9	8.	0	0	1	11
I	64	2	3.	0	0	0	0
J	15	2	13.	0	0	0	0
Totals	902	66	7.3	3	4.5	9	13.5

Cesarean section for preeclamptic toxemia, 66 cases. Maternal deaths 3. Maternal death rate 4.5 per cent. Fetal deaths 9. Fetal death rate 13.5 per cent.

Cleveland had in this series 66 cases of cesarean for preeclampsia. There were 3 maternal deaths or 4.5 per cent. Los Angeles had 187 cases with 11 deaths or 6 per cent, while Brooklyn had 106 cases, 7 deaths, or 6.6 per cent.

TABLE XX. CESAREAN FOR PREECLAMPTIC TOXEMIA: THREE SURVEYS

CITY	CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	66	3	4.5
Brooklyn	106	7	6.6
Los Angeles	187	11	6
Totals	359	21	6

Death rate one-fourth that of the same operation after convulsions.

The totals are 359 cases, 21 maternal deaths, an average rate of 6 per cent. We might add to this Greenhill's report from the Chicago Lying-In Hospital, of 85 cases with one death. This makes a total of 444 cases of preeclampsia with 22 maternal deaths or 5 per cent. Just why cases which have advanced to the convulsive stage should show such strikingly worse results than the preeclampsias is not quite clear.

At St. Luke's we never do a section for preeclampsia until a thorough test of medical treatment in the hospital has proved ineffective. We have long believed and taught that the best criterion for prognosis in these toxemia cases is not the quantity of albumin, nor the height of the blood pressure, but the resistance of the disease to proper treatment. We presume that this is the case in most maternities with good supervision. Cesarean section is therefore probably done in well regulated clinics only in selected highly resistant although less advanced cases.

We should of course expect better results in these cases than in the eclampsias, but the difference between 5 per cent or 6 per cent and 25 per cent is rather astonishing. We therefore believe that a severe preeclamptic who under vigorous well directed medical treatment in the hospital becomes progressively worse should be treated by cesarean section without undue hesitation or delay.

When one considers the fact that most of the cases of pulmonary embolism, of thrombosis and infarction following cesarean section are septic in origin, it becomes apparent that we might well add the cases in this group to those listed as septic. The total of the two groups is 44.

TABLE XXI. CESAREAN DEATH RATE FROM COMMON INDICATION AS SHOWN BY OUR SUMMARY

Uncomplicated obstructed labor	1.86
Cesarean following previous section	4.
Ablatio placentae	4.
Placenta previa	6.
Preeclamptic toxemia	6.
Eclampsia (preoperative convulsions)	25.

One-half of all the deaths following cesarean section in our series are therefore chargeable to septic infection in some form. We believe that the more general use of the cervical operation by competent operators would reduce the number of these deaths, especially those due to peritonitis.

TABLE XXII. CAUSES OF DEATH, CLEVELAND AREA FOR FIVE YEARS

Septic infection and peritonitis	32	
Embolism, thrombosis, infarction	12	
Total sepsis		44
Eclampsia	12	
Hemorrhage	7	
Pneumonia	5	
Cardiac	4	
Surgical shock	4	
Intestinal obstruction	2	
Strangulated hernia	1	
Acute gastric dilatation	1	
Not obtainable	1	
Total	81	

Eclampsia is the next most frequent cause of death. Our leading obstetricians are quite uniformly of the opinion that cesarean section is rarely indicated in the treatment of this condition. Some of these 12 lives might probably have been saved had medical treatment been adopted instead of surgical.

#### CONCLUSIONS

1. The primary or basic operative risk of the cesarean operation is high (one to two per cent). There is also a definite *late* or *delayed* mortality present with every pregnancy and labor occurring after one cesarean section. These considerations make the decision to perform the operation a grave one. The risk is real even under favorable circumstances.

2. However, statistics such as are being published from time to time showing the rapidly mounting number of deaths following cesarean section, should not be used as evidence that the operation is being abused. Such statistics merely show the more general use of this procedure in the treatment of grave pathologic conditions complicating pregnancy and labor. Reasoning of this type would prove diphtheria antitoxin a dangerous remedy.

3. The advisability of cesarean section for placenta previa, ablatio placentae, preconvulsive toxemia, etc., can be determined only by comparison of the results, with those obtained by other methods of handling the same conditions. The mature trained judgment of an expert obstetrician is necessary for such a decision.

4. In our series the low or cervical operation gives a definitely lower mortality rate than does the classical. We advise its use in all poten-



tially infected cases. In those with definite sepsis the Porro should be considered.

5. This series shows as do preceding ones, that the mortality following cesarean section for eclampsia is unjustifiably high. It is not good treatment for this condition.

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(For discussion, see page 277.)

## WHAT IS CONSERVATISM IN THE TREATMENT OF NEISSERIAN INFECTION?

By D. R. HUGGINS, M.D., PITTSBURGH, PA.

THE time when gonorrhea became the heritage of the genital tract in man and woman is uncertain. It may have accompanied the gradual evolution of the race. Its effects and clinical signs were described in the dawn of history. Fuller knowledge of its cause and a better understanding of its terrible effects followed the discovery of the gonococcus in the latter half of the nineteenth century, and the views of Noeggerath remain unchallenged to a very large degree. The development of abdominal surgery and the work of the pathologist during the last century have shown us the picture in its true light. While we are just as helpless as ever, so far as any cure in a bactericidal way is concerned, we have made distinct advancement in a general knowledge of the habits of this disease as it affects the genital tract of women. In the discussion of this subject, I do not wish to be misunderstood. So often a slight departure from the beaten path which sounds either more radical or more conservative is condemned without careful analysis. The main points are thus overlooked so that the effort to classify some of the factors in a difficult subject is entirely lost.

One of the most interesting things about infection of the fallopian tubes is the marvelous change that may take place in the course of this disease. From a simple inflammatory change with redness and the presence of free fluid in the pelvis during the first few hours of an acute infection, the picture changes rapidly and the extent of involvement within a few days may be so great that the tubes become enormously swollen and the entire pelvis blocked with exudate. One can never forecast the extent of a given infection at its onset. Both ovaries are usually involved to a certain degree and often one or both entirely destroyed before the extending infection becomes finally blocked. This picture is so common that it need only be mentioned. We must agree that it is a serious factor in the future health of a young woman, especially from the standpoint of disturbed ovarian function. Previous to the time when abdominal surgery exposed this field to the light of day and by the removal of these infected tubes cured those unfortunate victims, this

form of suffering among women was very great. During the acute stage, it was called inflammation of the bowels, and early medical history reveals the frequency of recurring attacks followed by chronic invalidism. Over fifty per cent of the surgery on the pelvic organs of women may still be credited to this disease. During the latter half of the last century, Sinclair, Lawson Tait and others placed the cure of this disease on a solid surgical basis and gave relief to a class of patients which up to that time were doomed to chronic illness. A careful study of histories of patients as related by these men reveals the same problems as we find today, and we may learn much by a careful study of their work and final conclusions. They encountered much opposition among medical men who criticized them as being too radical. It is but natural that for a period of years operations were suggested and done at times which were not to the best interest of the patient and as a consequence both mortality and morbidity were much higher than necessary. It led to operations at all stages of the disease and an unnecessary sacrifice of ovarian tissue.

We come to another very important landmark when it was recognized that it is much better, for obvious reasons, to defer operation until the active symptoms have subsided than to operate during the course of an acute attack. Much credit is due to Dr. F. F. Simpson of Pittsburgh for his pioneer work in this field. It brought a much needed change in the attitude of gynecologists and a healthy conservatism which has been productive of great good. With it, however, there have grown certain ideas and tendencies which need to be carefully scrutinized before finally accepted as conclusive facts in this important subject.

It is a foregone conclusion that a certain percentage of acute infections of the fallopian tubes recover entirely from a primary attack and that normal function returns. Pregnancy occurs and a normal delivery and puerperium follows. It is for this reason that operation should never be considered either during or following the first attack. It is here that conservative measures are indicated and recovery from the acute symptoms often occurs. It is well known, however, that all cases do not make a complete recovery. Often the disease becomes quiescent for a time and then recurs. During the interval, the patient does not completely regain her health, but continues under a handicap as a result complaining of pelvic soreness, backache, nervousness and chronic fatigue. Acute exacerbations with confinement to bed over a period of years becomes a great burden to the woman in poor financial circumstances. It is not only the physical suffering, but the constant financial drain that adds to the trouble. It makes no difference whether they are cared for at home or admitted to the wards of the hospital, the enormous expense of medical care becomes a great economic problem. Not only is the financial question a serious one. There is no doubt that a per-

sistent infection over a period of years finally interferes seriously with the general health of the patient. The chronic inflammation has a disturbing influence on ovarian function because the ovaries become secondarily diseased. It is a state of semi- or complete invalidism in many women on account of pain, fatigue, and nervousness. It seems to have become the habit to treat these patients in a so-called conservative way, not only during the acute stage but to continue to treat them through attack after attack with the idea that such conservatism is to the best interest of the patient. This is done apparently because they are able to go about and have acquired a certain tolerance to their symptoms. There seems to be an impression among medical men that these patients have recovered, and much stress is placed in some of our clinics upon the value of certain kinds of palliative treatment. A cure is oftentimes proclaimed as a result of some particular form of treatment when there is only a temporary quiescent period of the disease which will come from a period of rest or is perhaps the natural improvement which comes in the course of the chronic stage of this infection. While the acute symptoms may subside, such as pain, etc., on careful observation it will be found that the patient is still below normal on account of fatigue, nervousness and backache secondary to the low-grade infection which still persists even in the absence of all active symptoms.

The persistent effect from this chronic form of absorption over a period of years is not to be considered lightly and this particular feature of this disease should lead to the consideration of a removal of the tubes before the patient finally becomes a nervous wreck. Just why in a given infection, where there is only a mild involvement of the tubes, there is marked cirrhotic change in the ovarian structures with serious effects upon the function, is difficult to understand, for in others the inflammatory change may be much worse in both tubes and ovaries without much disturbance in the normal physiologic action. To the close observer cases of this kind are not infrequent and really have much to do with the suggestion that this subject should be carefully reviewed from the standpoint of what we are aiming at now in the way of preventive medicine.

A woman in good financial circumstances, and who desires to bear children, may be treated in this manner over a period of years, but it should be explained to her that the only way to complete recovery is through the removal of the tubes. It is then for her to decide whether her desire for children justifies a life of invalidism in the hope of conception which at best may be speculative. She is also entitled to the knowledge that with each succeeding year, there is greater danger of ovarian dysfunction and with every acute attack, the possibility of complete destruction of these organs. This decision should not rest with the gynecologist, but with the patient after she is made acquainted with the facts.

If any progress has been made in the last fifty years in the way of cure in these infections my remarks would be unnecessary. Aside from rest in bed over a period of weeks there is no palliative treatment that is of permanent value despite the claims of individuals from time to time as to the curative effects of certain procedures. So long as this disease has been known it has acted in the same manner. Some patients get well, others improve if allowed to rest for a sufficient period of time. The value of vaccine injections, of mild heat, light, and other things in a therapeutic way has been greatly exaggerated and these procedures are of no permanent good.

There is a time in the course of individual cases where we continue to treat them year after year without permanent relief when so-called conservatism becomes extremely radical in so far as effects are concerned. It is here that treatment should not be carried on without careful consideration of all the factors involved. It is not true conservatism to allow a patient to drift on into a state of semi- or complete invalidism unless she, after a full knowledge of the consequences, still persists in such a course. It is not economic but is wildly extravagant, both from the standpoint of health and finance. Some of the points in this discussion are brought out in the histories of two cases which clearly emphasize the responsibility, both from economic and health standpoints. Such patients are by no means scarce, and while the study of case reports is time consuming, yet they are often most convincing.

CASE 1.—A young woman, twenty-three years of age, had a sharp attack of salpingitis three years previous to her admission to the hospital. She was confined to bed for a period of two or three weeks but made a good recovery, so far as local complaints are concerned. Tracing her history carefully it soon appeared that she has never been as well as she was previous to this attack of pelvic inflammation. She complained of being tired and unable to perform her usual work without fatigue. So far as any pain, however, except an occasional slight twinge, she had none, but it was not difficult to determine that there was definite impairment of her strength and health. Two weeks previous to admission she had a recurrence of symptoms similar to her former illness, including severe pain in the pelvis, more particularly on the left side.

Examination revealed the presence of a marked cervicitis with a wide area of erosion. There was fixation of the left tube and ovary with some enlargement. The right tube was extremely sensitive but not palpably enlarged. Her temperature soon came to normal after admission. In view of the age of this patient and the great probability that if any operation was undertaken it would mean a sacrifice of her tubes, the subject was plainly discussed with her. It was explained that if she had the operation it would probably mean the loss of the tubes and subsequent sterility. It was also explained to her that no form of palliative treatment that we know at the present time would give her any permanent and sure relief; that her symptoms would probably continue with exacerbations from time to time and with a certain handicap, in so far as her general health was concerned. It was also explained to her that the longer this infection persisted the greater the likelihood of permanent disease of the ovarian structure. She was the main support of the family, her mother being a widow,

and one of her main considerations was the maintenance of capacity to work. It was explained to her that she might not have another attack for some time and that the handicap might not be any greater for the next two years than it had been in the past. All of these points were carefully discussed in order that she might be able to determine her own course of action as judged from her own conception of the amount of the pain, tenderness, and physical handicap that she experienced from day to day. It is only by such a course that any decision can be arrived at because in our opinion every patient has the right to determine, after she has full knowledge of the probable course of a disease, as to whether she will accept the hazard of the operation or continue in a palliative way with the hope that the infection may die out. She chose to be operated upon.

At operation the left tube was found markedly enlarged and adherent. The ovary consisted only of a shell of ovarian tissue, containing about 6 c.c. of pus. The right tube was not very much enlarged but a few cobweb adhesions surrounded the fimbriated extremity. The right ovary was about twice the normal size, containing some small cysts, and its consistency very much harder than normal, indicating the presence of considerable fibrous change in its structure. It was, of course, necessary to remove the left adnexa. To have left the right tube would not only mean a continuation of the infection but the great risk of complete destruction of the right ovary, a calamity to any woman of her age. The right ovary was not removed.

CASE 2.—Age twenty-two years. This patient was admitted to the Elizabeth Steel Magee Hospital on October 22, 1928, complaining of severe dysmenorrhea preceding menstruation and following it for ten to fourteen days. This has been present for the past eighteen months. She began to menstruate at the age of fourteen and was regular every twenty-eight days until the onset of the present complaint eighteen months ago. She is now irregular and the intervals between her periods vary from one to three months. The duration previous to the present illness was from four to five days. It now varies from six to fourteen days and the pain is gradually increasing in severity and length. She had been married for three years. Had one pregnancy which ended in a miscarriage eighteen months ago at the fifth month. This was followed by an illness which confined her to bed for two months. It was accompanied by an elevation of temperature. At the time of her admission the right adnexa was slightly enlarged, of limited mobility, and tender. Left adnexa was moderately tender, but no fixation or definite enlargement could be determined. Diagnosis: chronic bilateral salpingitis with oophoritis.

On account of the youth of the patient, together with the fact that she was quite desirous of having children, it seemed advisable after cauterizing the cervix to keep her under observation with the advice as to rest, etc., hoping that pregnancy might occur. An iodipin test made at this time indicated patency of the tubes.

This patient was again admitted to the hospital on July 20, 1931 with the following history:

For some time after her dismissal from the hospital three years ago she felt somewhat better. She then began to experience dull aching lower abdominal pain. The pain was bilateral and at times associated with backache. It was aggravated by exertion. She has had some vaginal discharge. Patient has been pregnant but once, as indicated in the history of her previous admission. One of her principal troubles at the present time is pain previous to and following menstruation, which is gradually increasing in severity. It generally precedes the flow for a week and sometimes lasts for ten or twelve days afterward. During the last two years the interval between menstruation has been increasing. Her



last menstrual period was four months ago. The patient was still extremely anxious to become pregnant.

Examination revealed the presence of a marked sensitiveness along the course of both fallopian tubes and ovaries. There was a definite sense of resistance, more especially on the left side, which indicated the presence of fixation of the fimbriated ends of the tubes and ovaries. The uterus was movable, but there was great sensitiveness in the cornua on both sides and in spite of the absence of enlargement, definite tenderness was present between the uterus and ovaries along the course of the tubes. The history of persistent sterility, a gradual increase in the dysmenorrhea for the past two or three years, with disturbed menstrual function, all pointed toward the existence of a low grade chronic salpingitis associated with chronic oophoritis. The gradual increase in the time between her menstrual periods suggested a progressive destruction of ovarian tissue from chronic inflammation. This patient was a typical example of the effects of gonorrheal infection of the tubes over a period of years, in this instance particularly unfortunate on account of the great desire for children.

While a careful review of her history and physical findings would seem to indicate that this patient complained to a considerable extent, it is interesting to note that one of her main reasons for returning to the hospital was a question of sterility. While she complained of some soreness and pain and irregular menstruation, these symptoms were really brought out more prominently by careful interrogation. In her great desire for children she placed only a moderate degree of stress upon these symptoms. This was true to so great an extent that the question arose of a possible case of endocrine disturbance with indications for glandular therapy. After a careful review of the whole subject with the patient, explaining to her the cause for her pain and telling her that an exploratory laparotomy might reveal a condition which would result in the loss of her tubes, she stated that after all what she most needed was to get well.

*Operation*—The uterus was found to be symmetrical, small, and of the hyperinvoltuted type. It was in good position and movable but its consistency was much firmer than that of normal. The tubes were thickened and contained a great excess of fibrous tissue. A few fine adhesions were attached along the serosal surface of each tube. The left ovary was enlarged owing to the presence of follicular cysts. Both ovaries were surrounded by dense fibrous adhesions which completely fixed the position of both ovaries and were separated with great difficulty. After freeing the adhesions about the ovaries, both tubes were removed.

A study of this case from its onset is extremely interesting from the standpoint of the damage to ovarian tissue from chronic adjacent infection, and represents a type of patient which is not unusual and one that must receive careful study and consideration some time in the course of the disease before the injury is beyond repair.

These patients represent types commonly seen and where we are inclined to postpone operative treatment from year to year, largely because of the great desire to conserve the fallopian tubes. There is no question that if a young woman would rather bear her ills and continue from time to time to have attacks of pain, every possible effort should be made to cooperate with her in any form of palliative treatment one may adopt. Every woman has the right to the chance of childbearing, even though the tubes may seem in a hopeless condition from that standpoint. She also has the right to speculate as to what may happen to the ovarian tissue and she has the right to under-

stand the problem as it exists and it is our duty to explain to her without prejudice and without opinionated conclusions as to the exact course of the disease and the probable consequences, if operation is not performed. The question of economy and home responsibilities are factors appreciated and understood oftentimes only by the patient herself and it is upon her, after the whole problem has been presented, that the responsibility must lie. We must not forget that the best interests of the patient must be served.

The habit of certain operators in removing one tube and ovary in the presence of a bilateral chronic salpingitis with the idea, perhaps, of saving the tube for a possible future pregnancy, or with the idea that the infection may subside, is a matter of serious concern. There is sound philosophy, if the tube is preserved, in the hope of future pregnancies, but where the history shows a chronic infection, which is bilateral, and where the patient has been having pain and repeated attacks of acute exacerbations, it certainly is of doubtful benefit with any other hope than that of possible conception. We are constantly seeing and operating upon patients where one tube and ovary have been removed, but the patient goes on with the same symptoms and finally comes to operation at a time when not only the tube must be removed, but the ovary as well, either on account of chronic fibrosis or the presence of an acute ovarian abscess. We have recently witnessed such an example in a large clinic, the history in the case being that of a chronic illness, symptoms entirely confined to the pelvis, and bilateral. When the abdomen was opened both adnexa were adherent, the left, perhaps, to a less extent than the right, but a hopeless condition from the standpoint of recovery. The right adnexa were removed, the adhesions separated about the left and the abdomen closed. In this instance the subject of future pregnancies was not the outstanding excuse for the retention of a diseased tube, but it was left because the operator considered the possibility of the infection dying out. This has become common practice. It has a widespread influence upon members of the profession whose experience does not seem to convince them that it is only a question of time until such an abdomen must be reopened, and perhaps at a time when the pathology has progressed to a much more serious degree. Such practice may be rational, if pregnancy is the outstanding hope, but to do it with the idea that the infection may disappear in these chronic cases, is not based upon unbiased judgment.

There is another phase of this subject that should be discussed because there is serious doubt that the final word has been said about the danger in operation within the first twenty-four hours of the onset of acute salpingitis. In our experience there is no greater danger and perhaps less in the removal of infected tubes within the first twenty-four hours of the onset of the infection than there is in the operation for an acutely in-

flamed appendix. The field is even a safer one at that stage of the disease. It is undoubtedly true that if further time has elapsed, with the rapid spread of the infection, pus formation, and extension into the lymphatics of the broad ligaments, the operation becomes increasingly dangerous. It is our conclusion that in a case where previous attacks have occurred and where the history shows that the patient has not been entirely free from symptoms between the attacks that in many instances it would be much better to operate at once just as we do for acute appendicitis. Otherwise it means only the waste of another period of time in bed, but it may also mean the formation of a tuboovarian abscess with its consequent disturbance to the welfare of the patient's health for several years to come. It should be repeated that this should never be done in the first attack or perhaps in the second or third, but that it does obtain in certain instances where the factors above mentioned are present. With advancing years this is particularly true for, with lowered resistance, there is greater danger of a more severe extension of the infection and consequently the disease is much prolonged. This is true after the age of forty and our experience has been such that we prefer to operate upon all such patients within the first twenty-four hours of the onset and do it with the feeling that the patient will escape many weeks of an illness that is uncertain in its outcome, both as to life and serious involvement of other organs. This is because of lowered resistance which is more marked as the time of the menopause is approached. These ideas indicate the value of the importance of different forms of treatment in selected cases, and it is our conclusion that if we could only see the case within the first few hours of its onset that the progress of the disease would be halted, the patient saved weeks of illness and the prognosis as to operative mortality just as good. The danger of operation at this time has been much exaggerated. Such a course will necessitate earlier and more definite decisions on the part of the practitioner of medicine so that such patients may be referred immediately for operation. The history is a distinct aid in such a diagnosis.

#### CONCLUSIONS

We are at the threshold of preventive medicine. It is the duty of the physician today to practice medicine that truly conserves, and it is being done constantly in all branches of medicine. To keep people at the highest state of health and happiness is our responsibility. It is no longer considered unusual to remove tonsils, gall bladder, or appendix as foci of infection in order to relieve rheumatism or to prevent chronic disease of the myocardium. It is the duty of the gynecologist to keep in line and not to allow his vision to become entirely clouded by recoveries which are often only partial, and when persistent, delay means great loss to the individual.

## ABDOMINAL TOTAL HYSTERECTOMY

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SINCE hysterectomy has become the routine treatment for a number of benign diseases of the adnexa and uterus, especially fibroids, the question of whether the subtotal or supravaginal hysterectomy or the total hysterectomy is more efficient and advisable, has been discussed many times.

At the very beginning of the development of operative technic, the subtotal hysterectomy was the method of choice, favored for its greater facility and for the security of the ureters, which at that time constituted for the surgeon a constant menace during the extirpation of the cervix. The advanced knowledge of pelvic anatomy and increased operative skill have reduced such accidents, so that the panhysterectomy has become more and more popular. Clinical investigations have shown that in spite of the greater facility, good results can be obtained by the subtotal hysterectomy only in selected uncomplicated cases. In cases of necrotic, secondarily infected tumors, pus tubes, after separation of adhesions resulting in bleeding, and the impossibility of perfect hemostasis, the total hysterectomy has been found preferable, securing as it does ideal drainage through the vagina. In spite of being handicapped by a selection of complicated cases with a higher operative risk, the difference in mortality between total and subtotal hysterectomy is so small that it can practically be neglected.

Even admitting that the subtotal hysterectomy may be easier, the report of the steadily increasing number of cases in which cancer has developed in the cervical stump is a serious warning against the routine use of the subtotal hysterectomy, particularly in a country where more has been done in research work and skillful propaganda against cancer than in the rest of the world.

Table I, while not including all the reported cases, shows that the incidence of cancer in the cervical stump after supravaginal amputation is very frequent. Since Chrobak of Vienna reported the first cases in 1896, 169 cases have been recorded in Germany up to 1925, while in 1921 Polak was able to collect 256 cases from the American literature alone, and 900 cases altogether. The reason for the large number in this country may be attributed partly to the more general use of subtotal hysterectomy, partly to a higher frequency of cancer. Hochmann estimates the frequency of this complication at 0.27 per cent, Polak and Sharples at 2 per cent. It does not make the least difference, either for the woman who has unfortunately become a victim or for the operator who is justly

responsible for it, whether this complication may be expected in 2 per cent or 10 per cent.

The fact that probably thousands of women develop a cancer of the cervix after subtotal hysterectomy and that every woman after such an operation is threatened by this danger makes it imperative that we abandon this inefficient operation.

TABLE I. CANCER OF CERVIX AFTER SUBTOTAL HYSTERECTOMY

<i>German Literature</i>			
Sanders	102		
Isbruch	65		
Fleischmann	2	Total 169	
<i>American and English Literature</i>			
J. O. Polak	256		
R. T. Frank	1		
W. F. Shaw	3		
S. S. Hochmann	3	frequency	
		0.27 per cent	
James C. Masson	29		
Charles Mayo	70		
C. W. Sharples	3	estimated frequency	
		2 per cent	
A. Stein	2		
L. Branscomb	46	Total 413	
Total of published cases	582		

In perfect agreement with Masson and Mayo in this country and with Ott and Weibel and others in Europe, I feel that a total hysterectomy should be performed as a routine and that there is no reason why the stump of the cervix should be left. It is functionally worthless and quite frequently even in the absence of disease previous to operation develops a more or less profuse discharge so often refractory to treatment (Masson).

It is true that both cervicitis and cancer can be reduced in frequency by thorough cauterization of the cervical canal to destroy the mucosa; but they are not absolutely eliminated, as cancer can originate from the squamous-cell epithelium of the vaginal surface of the cervix. Those who do not want to give up entirely the supravaginal amputation claim that it is important for every such patient to be followed carefully for the rest of her life.

The simplest and most efficient way to take care of the cervical stump is, as Doederlein says, its primary removal.

There are practically only two conditions in which partial removal of the uterus or its supravaginal extirpation is justified in favor of the patient: the possibility of preserving the menstrual function in young women by leaving some mucosa of the uterine body in order to prevent psychic depression and inferiority complex; and the extremely rare emergency cases in which the patient's life may be dependent upon



greater speed, as in cases of rupture of the uterus or in the sudden development of a serious reaction during operation.

The authors, who, in spite of the danger of the later development of cancer, advocate subtotal hysterectomy support their opinion mainly by the following three arguments:

First, a shortening of the vagina after total hysterectomy resulting in interference with intercourse. Against this argument it can be said that the vagina never shrinks so long as the ovarian function is sufficient. Actual operative shortening can be avoided by removing the cervix close to its insertion into the vagina. Furthermore, we know by experience that even considerable shortening of the vagina will be overcome in a very short time by regular use.

Another objection, nearly contradictory to the first, is that the vagina, being no longer supported by the cervix, may descend and prolapse. The vaginal wall is supported and fixed by the paravaginal tissue and by the endopelvic fascia between the rectum and vagina and the vagina and bladder, commonly known as the rectovaginal and vesicovaginal septa. The cervix has no function in preserving the topography of the vagina. In fact, large cystoceles occur in spite of the normal position of the cervix and sometimes remarkable descensus of the uterus without any dislocation of the essential lower part of the vagina.

These objections, which have arisen again and again, can be neglected, as they are not properly founded.

Of greater importance seems to be the higher mortality after panhysterectomy, compared with the operative results in subtotal hysterectomy.

TABLE II. OPERATIVE MORTALITY

AUTHOR		TOTAL HYSTERECTOMY PER CENT	SUPRAVAGINAL HYSTERECTOMY PER CENT
Weibel	Total	3.55	4.25
	Complicated	4.5	5.6
	Uncomplicated	2.2	3.4
Amreich		3.8	1.7
V. Ott	768 Cases	7.2	
	Last 375 Cases	0	
Shaw		5.9	3.05
Fullerton and Faulkner		4.1	4.4
		1.3	1.8
Masson		1.8	1.2
Mayo			

There are two fundamental, misleading errors in these statistical reports. In the first place, most of the statistics cover a long period of time, extending over fifteen or more years, as for instance the material of Weibel, which includes the cases of Chrobak, von Rosthorn, and Wertheim, who successively administered the II. Frauenklinik in Vienna. A calculation of this kind leads to mistakes because the final death rate is burdened by the higher mortality of the early cases done during a

period of an undeveloped operative technic. Von Ott, who had a mortality rate of 7.2 per cent in 768 cases, reports that he has not lost a single patient among the last 375 operations. The other mistake which makes the difference in mortality in the two operations entirely worthless as an argument in favor of or against either one, is the fact that the group of cases treated by total hysterectomy includes all of the difficult and complicated cases with a higher operative risk. It is very probable that the mortality would have been much higher if these patients had been subjected to the easier and less dangerous supravaginal amputation. In spite of all this, the difference in the mortality rate, especially in Mayo's statistics which include 3085 subtotal and 1588 total abdominal hysterectomies from 1916 to 1929, shows such a slight variation that it is by no means justifiable to use this difference as an argument against total hysterectomy. Moreover, I have not lost a single patient in a series of something over 200 cases of abdominal total hysterectomy. I feel that the good results I have had personally are mainly due to the minutely developed technic of my teacher, Prof. Wertheim, which we used routinely at the Second Frauenklinik in Vienna.

The main points of the procedure are as follows: Incision of the vesicovaginal fold and sharp dissection of the bladder down to the level of the anterior fornix of the vagina. This maneuver retracts the vesical and paracervical portions of the ureters out of the danger zone so that the operator can insert clamps safely along the sides of the uterus down to the vaginal vault. The uterus, now perfectly mobilized and held merely by the vagina, is pulled up and the extended fornix of the vagina is opened with the scissors. The vaginal margin is elevated by a volsella and a sponge is introduced into the vagina to avoid the spread of infectious material. Then the vaginal portion of the cervix is everted by means of a tenaculum forceps inserted on the anterior lip. This gives an excellent, clear exposure of the cervical insertion so that further dissection can easily be made exactly along the insertion of the cervix on the vagina. After the removal of the uterus the vagina is fixed by four stay sutures and, if necessary, more hemostatic sutures are placed on the vaginal margin. While the vagina is kept tightly pulled up against the symphysis by one assistant, the clamps on the broad ligaments are replaced by sutures. Then a strip of gauze is introduced into the vagina to provide drainage. The vaginal sutures are cut and, beginning from the infundibulopelvic ligament or from the stump of the adnexa, all the raw surfaces are buried by interrupted sutures. The vagina stays open and acts as a natural drainage canal for all the extraperitonealized ligature stumps.

#### CONCLUSION

The difference in mortality in operated cases, between subtotal and total hysterectomy, is not noteworthy and is due merely to the selection of more grave conditions for the latter operation.

Every patient with an amputated uterus is threatened during her lifetime by cancer of the cervix. If we believe in the value of active prophylaxis in the struggle against cancer and in our duty to do the best for our patients, we should perform total hysterectomy routinely, reserving the subtotal operation for a few selected cases.

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(For discussion, see page 290.)

## THE ROLE OF FOCAL INFECTIONS IN THE ETIOLOGY OF TOXEMIA OF PREGNANCY

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THE conception of pregnancy toxemia as an infectious condition is by no means a new one. In 1884, before the *Congres de Blois*, Delore, of Lyons, set forth a theory "though without being able to present absolute proof," that eclampsia is essentially microbic in origin. He argued that eclampsia produced prodromal symptoms analogous to those of infectious diseases which were known to be due to alterations in the blood content occasioned by the presence of microorganisms: That the extremely high temperature regularly seen in eclampsia (29° up to 42° C.) was likewise characteristic of infectious diseases; that eclampsia had repeatedly been observed to occur in apparently epidemic form, large numbers of cases appearing simultaneously in a single locality or in the practice of a single physician, or clientele of a maternity hospital, having many of the characteristics of tetanus which was now, that is in 1884, coming to be regarded as due to a specific microbe; that many microbic diseases are initiated by convulsive seizures; that the high mortality of eclampsia was similar to that of other infectious maladies, e.g., puerperal and typhoid fevers. Delore had worked diligently in the laboratory in an endeavor to make demonstration of the truth of his theory, but the blood of eclamptics had failed to show anything at all characteristic.

From time to time later workers took up Delore's problem, but with no more positive results. In 1911, twenty-seven years after the meeting at Blois, Billings enunciated his theory of focal infection, and we shortly came to realize that we must abandon the old classifications of aches and pains into sciatica, rheumatism, arthritis, etc., and refer them all to the basic cause, upon the elimination of which their cure depended.

Though Billings' pronouncement at once commanded an attentive hearing, it was not for some years that his findings were applied to the toxemias of pregnancy. Today, after the lapse of almost half a century, we are but little further on than was Delore. We have never been able to find a specific germ responsible for eclampsia, and the belief entertained by some of us that we can trace the toxins circulating in the blood of the eclamptic to some definite focus of infection in her body, outside the special structures requisite for gestation, still lacks positive proof. But views similar to those entertained by Delore had been voiced even before Billings and Rosenow had begun their work. In Russia, before the end of the Nineteenth Century, Stroganoff offered many of the same arguments which the Frenchman had used, claiming in addition that one attack of eclampsia always conferred immunity. As this contention was not true to the experience of a vast number of obstetricians, it tended to throw doubt upon the soundness of all Stroganoff's views, so his theory did not command the attention its merits actually warranted. It has remained for workers in the last decade, Young in Scotland, La Vake and Talbot in this country, should be especially mentioned, to give particular attention to this aspect of the vexatious pregnancy toxemia problem.

Impetus has been given to this study by the efforts lately made to secure better care of pregnant women and to improve the condition of infants by taking active steps in their behalf *before* they present themselves to our attention. We are thus engaged in demonstrating the fanciful assertion made more than half a century ago, I think it was Oliver Wendell Holmes, that a man's education should begin three hundred years before he was born. As every obstetrician knows, Holmes did more to stop the terrible sacrifices of women upon the altar of maternity than any single individual since, and it is not surprising that he entertained ideas in advance of his time on certain other aspects of the branch of medical science with which he chiefly concerned himself. He may have been thinking of three hundred days when he said three hundred years. Certainly, our efforts to promote the welfare of the pregnant woman and the unborn child, and our study of the causes which operate against their welfare, ought to begin at the earliest possible moment.

The foundation of prenatal care is the thorough and complete physical examination. One of the chief features of such examination is the discovery and elimination of focal infections. On this point all schools of thought in regard to the production of the so-called toxemias of pregnancy are absolutely in accord. Even those who deny the possibility of infection being responsible for any of the complications arising during the gestation period, are none the less convinced of the importance of cleaning up abscessed teeth, diseased tonsils and inflamed sinuses. An authoritative monograph recently published states that "At present, no one seriously believes that there is any basis for regarding eclampsia as

due to any specific bacterium," but it continues to sum up the views of some of the leading exponents of the theory that focal infection is responsible for much of the pregnancy toxemia.

And from widely differing sources the evidence in favor of an infectious origin of many of these disturbances continues to pile up. Fowler, studying the records of 600 private cases, found focal infections in 42 2/3 per cent. Among the women who presented these foci of infection were found 75 per cent of the instances of excessive vomiting, all the cases of late toxemia, with 80 per cent of the threatened, and 71 per cent of the actual, premature terminations of pregnancy. Before that F. S. Kellogg observed in the obstetric service of the Boston Lying-in Hospital that 12 per cent of parturient women who had manifested toxemia during pregnancy had a febrile temperature after delivery, and no less than 25 per cent of the eclamptics ran an elevated temperature after delivery. This was following various methods of delivery, so that it could not be traced to puerperal infection. This would certainly point toward a systemic infection existing before labor began.

That the excessive vomiting occasionally seen early in pregnancy may be due to toxemia, is an idea entertained by obstetricians for a long time. Martin, as far back as 1921, gathered data on this phase of a much-vexed question. He cited the explanation of the source of such toxins given by Dirmoser, as being the most rational which had come to his attention. This author considered that the excessive vomiting is a reflex irritation of the sympathetic nervous system, commencing in the internal sexual organs, and through the secretory and motor fibers of the sympathetic leading to the production of changes in the biochemical processes, of the digestive tract especially. These are followed by atony of the intestines, and an increase in the production and absorption of toxins within its lumen. In the urine of pregnant women suffering from excessive vomiting, he found an increase in uric acid, aromatic sulphate, indoxyl, phenols, and other toxic substances, and when rabbits were injected with the derivatives from these patient's excretions, the animals promptly died, while those injected with excretions from normal women, whether pregnant or not, did not have a fatal effect. Severe constipation has regularly been found in the victims of this particular pregnancy complication, and in Martin's own cases he found bad teeth as well as intestinal stasis in every woman who showed excessive vomiting. While this evidence is hardly more than suggestive, it is interesting as having been brought forward before the theory of dental foci of infection had made any appreciable headway, even in this country where it originated. It is hardly probable that Martin in Edinburgh had given much attention to the theories put forth by Billings of Chicago only a short time before. Yet much of the recent work on focal infection has demonstrated how often the lower part of the digestive tract is implicated, either as an original focus, or, more commonly, secondarily infected from



focus located in the upper part of the body. Viewed in the light of this more recent knowledge the connection is not nearly so "far-fetched" as it may have seemed at the time Martin wrote.

Within a year or more, another Edinburgh physician, James Young, made an extremely important contribution to the subject. In a paper published recently, Young sums up his earlier work by saying, "The original investigations professed to show that the eclamptic and the pre-eclamptic toxemias were dependent on a placental necrosis, and they culminated in the experimental reproduction in animals of a disease closely simulating the classical picture of eclampsia." Later he took up the clinical side of the investigation, and decided that the toxemic states we are accustomed to call eclamptic or preeclamptic are the result of the circulation in the maternal blood of some specific substance which produces definite effects which he postulates as follows:

(1) Degenerative changes in the kidneys, and albuminuria; (2) characteristic necrotic lesions in the liver; and (3) convulsions. This pathologic syndrome is not seen outside of pregnancy, so it is reasonable to assume that it is in some way dependent upon the presence of the child in utero; either generated by the body of the fetus itself, or the placenta or other tissues connected with gestation. As identical manifestations have been witnessed when there was no fetus, but a hydatiform mole; it would suggest that the placenta is the toxic agent.

Clinically, it has been observed that the placenta expelled after long-continued pregnancy albuminuria often shows multiple infarcts and areas of necrosis. But in opposition to this is another observation frequently made; that is, a perfectly normal placenta obtained in cases of fulminating eclampsia. Young states that what first attracted his attention to the possibility of placental infarction's connection with pregnancy toxemia was the discovery that, although obvious placental disease might be absent in the placenta of a fulminating eclamptic, in other, less violent types of pregnancy toxemia, where days or weeks might elapse between the seizures and the expulsion of the placenta, massive necrosis was always visible without the aid of the microscope. In the large obstetric service of the Royal Maternity Hospital at Edinburgh, he had never seen an exception to this rule. This showed that a degenerative change is always present in the placenta, and that the passage of considerable time is required before it can evolve into the form of infarction readily visible to the naked eye. Young's observations would seem to indicate that if the necrotic areas are the focus, whence is derived the eclamptic toxin, this poisonous substance must be generated during the early autolysis of the degeneration process, while the placenta shows few or no evidences of necrotic change. "By the time the process has progressed to the stage of ordinary naked-eye infarction, the damage has been done."

The major symptoms of eclampsia he believes due to the flooding of the maternal circulation with degeneration products from structures



such as the liver, which had been injured by the placental poisons. Localized degeneration of the placenta must be due, according to his reasoning, to blocking of its blood vessels, though examination of an infarcted placenta will not give microscopic proof as to whether the necrosis followed or preceded the thrombosis. To point out the existence of thrombosis is far easier than to account for it. In placenta previa detachment of the placenta from the uterine wall may cause a degeneration which ends in toxemia. Is it possible that a similar mechanical influence may be at work to cause thrombosis of the maternal vessels in cases of toxemia without placenta previa? In certain of this author's cases there occurred retroplacental bleeding associated with a hemorrhage of the uterine wall, the tube and the broad ligament, which could only be explained as due to a strangulation of the ovarian vein. It is known that in primiparae especially, there are evidences of increased intraabdominal tension. The familiar phenomenon of swelling of the feet and legs is practical evidence of this. Is it possible, the author asks, that similar agencies may cause venous stasis?

After the lapse of seven years Young undertook to answer some of the questions he had raised in his earlier communication. "There is now," he tells us, "much evidence for the view that the eclamptic and the recurring toxemias have a similar origin in the diseased placenta, and that in both types the kidney lesion is secondary, and is often aggravated by the placental damage which occurs in successive pregnancies." Again he says, "Toxemia occurs only when, after placental damage, the abortion or premature birth does not occur soon enough or quickly enough and a large mass of dead or degenerating tissue is left within the uterus in immediate relation to the maternal blood stream, one can conceive that the factors which cause placental damage may be local or general. In the present state of our knowledge we can only speculate, but infection must necessarily thrust itself to the forefront in our search for such acquired causes."

The paper from which the foregoing quotation was made was presented in April, 1927. Thinking its author might have modified his views in the intervening four years I wrote to him, but in his courteous reply he refers me to these very passages as illustrative of his present views.

It was in 1916 that La Vake of Minneapolis discussed Young's work and applied the Edinburgh man's deductions to his own clinical experience. This led him to the conclusion that the thromboses were, in the majority of cases certainly, due to infection. He undertook to go deeper and prove the fundamental action of the infection. Studying the cases of eclampsia and other pregnancy complications coming under his observations, he noted that in all the histories there was mention of infection or foci which were demonstrable on examination. It was notable that most of the women were running a temperature when first seen, so that manipulation after reaching the hospital could not account for it.

Likewise there were many multiparae who had previously had normal pregnancies, but in whom foci of infection could be demonstrated which were proved to have been absent during the previous pregnancies. In a personal communication Dr. La Vake recently asserted that it is his belief that infection acts by inducing changes in the placenta. These changes are grossly signalized by infarction, and it is autolysis of these infarctions which generates the toxins (in accordance with Young's views), or the alterations in the placenta permit the absorption of toxic products from the fetus, which in turn, produces the characteristic lesions.

It has been argued that we have no proof that the infarcts seen in the placenta are due to infection, that they may be just an evidence of an aging organ, or of abnormal alteration in a rapidly growing one. La Vake answers this objection by citing his experience in the great influenza epidemic of 1918. Nearly every placenta seen in the miscarriages or premature labors for which this fearful plague was responsible, was filled with infarcts. A similar phenomenon is seen during every epidemic infection. The placenta is regularly infarcted in cases of pre-eclampsic toxemia, and the exceptional cases which do not show infarction, will have areas showing changes in color strongly suggestive of pathologic alteration, though he is not prepared to state positively that such areas indicate beginning infarction.

Perhaps the most ardent advocate of the infectious theory of pregnancy toxemia is John E. Talbot of Worcester, Massachusetts. For more than a decade he has given the subject intensive study, and though he recently told me that he has found his thesis almost impossible to prove, he is yet convinced that there is an etiologic relationship between chronic infection and the toxemias of pregnancy. His deductions from experiment and clinical observation he has himself summed up as follows:

1. The white placental infarct is the end-result of a hemorrhagic lesion, its evolution being described as a coagulation necrosis.
2. The lesion is a discrete process, often multiple and often repeated in the same placenta.
3. The placental lesion is secondary to a hemorrhagic lesion in the maternal blood vessels of the placental site.
4. There is clinical and histologic evidence that the primary lesion in the maternal blood vessels of the placental site is infectious in origin.
5. The clinical sequence of events observed shows that the lesion is the result of hematogenous infection and that the source of the infection is generally to be found in the teeth and tonsils.
6. By the determination of the infectious origin of placental infarcts, a large clinical entity is demonstrated in pregnancy which has chronic sepsis as its initial lesions.

It is apparent that this conception embraces those of both Young and La Vake, but is far wider in its scope than that of either of these investigators. Talbot does not refer the *primary* cause of pregnancy toxemia to

any one of the products of conception. He postulates a primary focus quite outside the region of the body which chances to be affected, thus placing pregnancy toxemia in the same class with infectious arthritis, which is positively known to be referable to a distant infective focus. Thus he is able to harmonize most of the heretofore prevailing theories as to the origin of eclampsia and allied states. The renal disturbances, which are not often incriminated, can be explained by the secondary effect which a chronic septic process is known to have upon the kidneys. Such a process is capable of causing an inflammatory reaction which can partially or completely inhibit renal excretion, and thereby acts disastrously upon the entire system of elimination. Since the pregnant woman has a double burden of elimination, any such sequence in her body is more disastrous than in the normal and nonpregnant. Talbot believes that the manifestations of pregnancy toxemia are due to the retention of the normal physiologic waste products of gestation. These products are retained because the kidneys are so damaged that they cannot carry on their proper work. Their damaged condition is the result of an infective process the effects of which have been conveyed to them in the blood stream. The reaction of the circulatory system to this wholesale dumping of uneliminated waste is a rise in blood pressure. High blood pressure is accepted as one of the earliest evidences of pregnancy toxemia. Many instances are on record where arterial hypertension has been relieved by the clearing up of toxic foci in teeth, tonsils and elsewhere, and there is also considerable data at hand to demonstrate that disturbances in renal function, notably albuminuria, have also yielded to similar prophylactic measures.

The array of evidence tending to show that pregnancy toxemia is dependent in many instances upon infection derived from a focus outside the products of conception has now reached impressive proportions, even if it cannot as yet be regarded as fully convincing. The most important advance which this conception has made is its correlation of other theories, so that the phenomena upon which they rely are fully explained and brought into harmony with the infectious conception, instead of being discarded and disproved, at least to the satisfaction of the holder of the newer theory, as is usually the case when a new answer to a controversial question is brought forward. We must learn to look upon pregnancy toxemia as a disease that, although peculiar to the gestation period, manifests symptoms which show it to be the same nature as other affections which are seen in the nonpregnant or possibly in the other sex. Chronic nephritis is seen in men and women alike, and its origin has been positively traced to an outside focus of infection. There seems to be good reason to believe that the kidneys may become infected secondarily, either from some original source such as abscessed teeth, nasal sinusitis or diseased tonsils, or the placental site may develop infection from such a focus, this in turn reacting upon the renal system.

Since I have been examining placentae with this idea of infectious emboli in mind it has become increasingly evident to me that the bacteria emptied into the blood stream from infective foci are much more prevalent than previous clinical experience had led me to believe. One experiences a feeling of surprise that the majority of pregnant women escape toxemia during the gestation period; the conditions favoring it are so universal it seems impossible for any to escape. The prevalence of infective foci such as are found in the gums, the tonsils and the nasal accessory sinuses, is by no means confined to the patients who frequent free clinics. With the increasing care in examining pregnant women of all classes these infections are continually uncovered in every grade of society. Precisely the same observations are made by those who conduct periodic health examinations of both men and women. Yet many individuals seem to be able to carry these heavy loads with immunity, and to appear in excellent health despite this serious handicap.

Granted that an individual possesses great natural resistance to the poisons he is constantly generating and distributing through his circulation, he can only remain in apparent good health as long as his metabolic balance is maintained. Placed under some extra strain, this balance is overturned, and the organism will be unable to readjust itself. Pregnancy places just such an extra load upon the woman's organism, and the placenta and the other gestation products offer an ideal site for the development of secondary infection. If the kidneys have been weakened as by pyelitis or the exanthemas in early childhood, they will be the first part of the excretory system to fail. And other lesions found at autopsy upon subjects who died of eclampsia, or symptoms manifested by those who recover which point to involvement of other organs, may be accounted for in the same way. A visualization of eclampsia as a systemic infection brings into harmony many factors which have heretofore been impossible to synchronize in relation to any single etiologic conception.

The convulsions and other manifestations of the eclamptic state may be accounted for by the action of the circulating bacterial toxins upon the sympathetic nervous system. Talbot stresses the effect which increased tone in this system has upon the smooth muscle, and its reflection in the intestinal stasis and increased arterial tension are often the first signs that complications are arising in what has previously appeared to be a perfectly normal pregnancy. The retention of waste products which is the immediate cause of the characteristic manifestations of pregnancy toxemia, is in a measure related to this hypersensitive state of the sympathetic nervous system, which is nature's effort to correct the disturbed metabolic balance. The differences observed in various subjects who may appear to be suffering from precisely the same causes, depend no doubt upon the individual's resistance to the invasion of her blood stream by the infective agents. Once the general conception of

eclampsia as an infectious disease has been grasped, the various features of individual cases fall naturally into order in their proper relations one to another. It may not yet be possible to explain every feature of every case, but I am none the less convinced that in the theory of focal infection as a factor in pregnancy toxemia, we have a more rational basis upon which to work out an effective therapy than any which has heretofore been brought to our attention.

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899 MADISON AVENUE

(For discussion, see page 293.)

## THE TREATMENT OF PUS TUBES

By J. F. BALDWIN, M.D., COLUMBUS, OHIO

THE discussion, in regard to operating on cases of acute salpingitis, which took place at the Sixth British Congress of Obstetrics and Gynecology (*Journal of Obstetrics and Gynecology of the British Empire*, April, 1927), was very interesting and illuminating, but showed very conclusively that few, if any of those who took part in the discussion, ever practiced careful individualization of their cases. Their position was similar to that which has long prevailed with many members of the profession as to nonintervention in cases of puerperal infection, these members grouping all their puerperal patients together instead of individualizing them, so that annually many have been allowed to die who could have been saved by proper and timely operation.

Among the first to advise against any operative procedures in cases of acute salpingitis was Dr. F. F. Simpson. His argument was well presented, and his advice very widely followed, even to the very letter; but active reaction against such a course was presented at the above meeting of the Congress, and at the present time there is quite a pronounced feeling among many gynecologists that that extreme view should be modified and a more rational middle-ground taken by the profession.



If all these cases were due to the same organism, and all patients had the same powers of resistance, a uniform rule might readily be adopted; but the infection is notoriously of varying virulence, and with vast differences in the powers of resistance possessed by the patients. For these reasons, therefore, as I have been urging for years in the matter of puerperal infection, each case of salpingitis should be individualized. There is not the same urgency usually as in cases of acute appendicitis, but some cases are decidedly fulminant and hence each patient should be carefully watched from day to day, with careful attention to pulse and temperature, with repeated blood counts and the most painstaking oversight by the physician in charge.

If the patient is doing well she should be treated expectantly, but otherwise an operation should be done, the extent of which must be determined in each case when the abdomen is opened. If, owing to the virulence of the infection or the lack of resistance of the patient, the disease is rapidly progressing, there should be no delay in operation, and with the abdomen open, the surgeon must use his own judgment as to the extent of the operation required. It is delay that gives us the death record in these cases and the unnecessary end result of pus tubes with all their complications.

Surgical intervention, other things being equal, is always advisable in cases in which there is reason to believe that the function of the tubes is lost and that their further retention will be a source of more or less discomfort with ample possibilities of serious results, particularly in the way of ovarian involvement. The removal of the tubes, and in the great majority of cases the uterus, with saving of the ovaries if healthy and the patient under forty, is practically the safest treatment of these patients and as a rule is attended with the most satisfactory results as to the future happiness and well-being of the patient.

It is doubtless true that the great majority, perhaps 90 per cent, of cases of a simple gonococcus infection will with proper attention make a symptomatic recovery, except probably for sterility, for we must not forget the contention of Noeggerath, yet repeated recurrences must be expected with their dire ultimate results. For the purposes of this paper, therefore, under the term of pus-tubes are included hydrosalpinx and all the other forms of chronic salpingitis, with accompanying sterility, adhesions, retroversion, leucorrhea, dysmenorrhea, backache, and above all pronounced, and frequently prohibitive, dyspareunia. Acute salpingitis will not be considered.

I have operated literally upon thousands of these patients, and there is no operation that I do, the end results of which I anticipate with as great soul-satisfaction as those made for the restoration of these poor sufferers to good health and happiness, including their restoration to conjugal normalcy.

In all patients in whom the ovaries can be saved, it is advisable if possible to save the tubes also, because of the better blood supply which



is thus retained. They should be attached, after carefully covering all raw surfaces, high up on each side so as to obviate the dyspareunia which is so liable to occur if they are merely dropped into the culdesac.

In removing the tubes all experienced operators will agree that the tube should be excised by an elliptical incision so as to remove that portion of it that is in the wall of the uterus; since otherwise a chronic condition may persist at that point.

In the neglected patients, in whom tuboovarian abscesses have developed with extensive destruction of ovaries and tubes, a complete hysterectomy should be made, including the cervix. The uterus itself in these patients is almost invariably more or less infected, is a distinct menace to health and even life, is utterly without value, and its removal, therefore, clearly advisable; even in patients in whom menstruation could be maintained because of the saving of the ovaries, I have not yet found a patient who expressed the slightest regret over the loss of the menstrual function when assured of the preservation of the ovaries.

In these conditions the peritoneum of the true pelvis is extensively involved, and frequently indeed destroyed, leaving on removal of the diseased organs an oozing raw surface. In such cases the technic which I have used in large numbers of cases and have found exceedingly satisfactory, but which I find is apparently used by few others, is to attach the round and broad ligaments into the vault of the vagina at each side so as to provide ample support for the vagina, split the posterior vaginal wall down, or nearly down, to the bottom of the culdesac, pass into the vagina the ends of two or three strips of washed iodoform gauze, and then lightly pack the rest of the strips into the culdesac until the pelvis is comfortably filled, but not too tightly. The sigmoid is then swung around so as to cover this gauze fluff and is then attached by a continuous catgut suture to the healthy peritoneum at the brim of the pelvis. Care should be taken that there is no sharp angulation of the sigmoid at any point, but that it is left with smooth curves. Occasionally it is too short, and under those circumstances the cecum can be swung over so as to close that side of the pelvis. In this way there is no raw surface at any point, and the abdominal cavity is completely shut off from the more or less raw or infected pelvis. Any oozing that follows escapes directly into the vagina, and the gauze can be readily and safely withdrawn at the end of a week.

The gauze strips are each a yard long with selva ends, and twelve inches wide: each strip is folded lengthwise, with both edges turned in so that there will be no ravelings, and then is refolded so as to be three inches wide and of four thicknesses. Before insertion the gauze rolls are dipped in hot water and wrung out firmly so that any excess of iodoform is removed and the gauze is left moist so as to be "greedy" for absorption. After closing the abdomen a vaginal examination is

made to see that the ends of these strips are within easy reach, and then the fluff is left undisturbed for one week, when all of it is withdrawn with later sterile douches as they may be needed for cleanliness and comfort.

At the end of the week the sigmoid has become sufficiently adherent to the pelvic brim and as further healing takes place it gradually sinks down into the pelvis but without any such angulation as will interfere with defecation. No suprapubic drainage is necessary, but all is provided for through the vagina. In a few cases it will be wise to attach a little extra piece of gauze to one of the strips, this extra piece to be passed a little higher up, usually along the cecum, if an infected area has been found in that region. The appendix should, of course, be removed as a routine, since it is almost invariably involved in the inflammatory process.

In attaching the sigmoid to the border of the pelvis, I always commence at the left side. If an ovary has been saved, it is brought up between stitches above the sigmoid, so that it will not be buried in adhesions. A continuous chromic catgut suture is used, the stitches catching the appendices epiploica, the mesosigmoid or occasionally, if necessary, some of the fibers of one of the longitudinal bands, in this way avoiding any possibility of penetrating the sigmoid. After completing the line of suture, the omentum is brought down carefully so as to still further protect, and the incision closed.

What surgeon it was who first suggested this use of the sigmoid I do not know, but I would like to give him full credit for having suggested a technic of the greatest value but which seems to have been very generally ignored.

One most important point in making an abdominal panhysterectomy,\* but one which from personal observation I know is very frequently more or less ignored, is the preliminary thorough sterilization of the vagina and endometrium. The surgeon should attend to this himself, not trusting it to a nurse or intern or perhaps even to his first assistant. The vagina should be thoroughly scrubbed out with tincture of green soap and hot water. The anterior lip of the cervix then steadied with a volsellum, and full strength tincture of iodine injected into the uterus with a pipette. The withdrawal of the pipette is followed by the escape of any surplus iodine. The vagina should then be thoroughly flushed out with dilute tincture of iodine, the excess of this being wiped out with gauze after removing the volsellum. By the use of this method in several thousand hysterectomies I have never had any peritonitis develop from ascending infection from the vagina.

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(For discussion, see page 284.)

\*For the author's technic of abdominal panhysterectomy, with removal of cervix, see Proceedings of this Association for 1916, or the J. Obst. & Dis. Child. 75: No. 2, 1917.

## THE LATE SEQUELAE OF ECLAMPSIA

By M. P. RUCKER, M.D., RICHMOND, VA.

IN JANUARY, 1931, I presented before the Richmond Academy of Medicine a study of 204 cases of eclampsia. These cases were divided into three groups according to the method of treatment employed. Group I, 38 cases with 12 deaths, occurred in the period when our own chief idea in treatment consisted of immediate delivery either by accoucheement forcé or cesarean section. Group II, 58 cases with 15 deaths, came at a more conservative period when reliance was placed upon morphine, chloral and bromides with repeated stomach washings and colonic irrigations. Group III, 108\* cases, with 6 deaths, begins with the advent of magnesium sulphate for the control of convulsions. Little else was done to these patients except to give a massive dose of digitalis and plenty of water by mouth. I also attempted a follow-up study of the 171 survivors, but this was extremely imperfect, because of the lack of time.

The present study is a continuation of this follow-up. The cases were derived from three sources, first, private practice; second, cases that came under my supervision on the out-patient service of the Medical College of Virginia and the wards of the Memorial and St. Philip Hospitals, and third, homes for the care of unmarried mothers.

It was comparatively easy to follow up the first group. Two patients were lost track of. With few exceptions the remainder have either been seen personally or by their referring physicians, and I want to take this opportunity of acknowledging my indebtedness to the latter for their co-operation. The second source group has been much more difficult. The majority were colored, and they have a way of changing their names at the least provocation and even when they keep the same name over a period of years they are apt to spell it differently. The third group was practically impossible from a follow-up standpoint. The patients were known only by their first names and many of them came from other states. When they left the institution they disappeared completely.

The technic of following up the clinic cases was as follows. First, a search was made in the city directory and all possible addresses looked up in person. This yielded a few finds. The visiting nurses found several more for me. The records of the Memorial and St. Philip Hospitals yielded one return case, a patient who had an operation for pelvic inflammation two years after the delivery. A menstruating sinus developed in the wound which was removed at a later operation so that the patient was under observation for some time. The files of the out-patient department of the Medical College of Virginia yielded several

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\*There have been two cases since January, 1931, with no deaths.

subsequent observations. Two returned to the eye department, but the records show that there were no eye ground changes but merely refractive errors. One woman became syphilitic five years after the eclampsia and was treated in the clinic. Two others returned to the venereal clinic the year after their confinement, one for syphilitic treatment and the other for hypertrophic vulvitis. The latter has been under observation for the past three years. Finally the City Board of Health records were searched for births and deaths and those of the State Board of Health for births, deaths, and marriages. This yielded considerable information as to the number of subsequent deliveries, but could not be expected to tell much about abortions and toxemias. The last birth certificate on file gives fairly accurate information as to the number of live children the patient has had. As Richmond is a pleasant place in which to live and nobody leaves it who does not have to, it is fair to assume that the majority that cannot be found are alive but have had no more babies.

There were forty-two in the private group who were traced. However, two are recent cases and a year has not elapsed since their eclampsia. Three others had their convulsions in 1929. In the remaining 37 cases at least three years have passed. The greatest number of post-eclamptic years in the series was twenty-eight. Three patients gave a history of a previous attack of eclampsia. Sixteen have had only one subsequent pregnancy and 2 of these were toxic. One of these cost the patient her life. Five have had 2 subsequent pregnancies and 2 of these were toxic. Four have had 3 subsequent pregnancies with two toxemias. One has had 5 subsequent pregnancies with one case of toxemia. In other words there were 43 subsequent pregnancies with 7 toxemias (16.3 per cent). Seven (16.6 per cent) pregnancies ended in abortions or miscarriages and one patient is still pregnant and is toxic. The 42 pregnancies (deducting the one that is still existing) yielded 28 live births (66.6 per cent). The 42 cases of eclampsia yielded 23 live births. Eighteen of the 42 patients had 32 pregnancies before an attack of eclampsia. Nine of these ended in abortions and miscarriages. There were one stillbirth and 23 live births, 68.8 per cent. The total number of pregnancies, preeclamptic, eclamptic and post-eclamptic was 119 with 74 live births or 62.2 per cent.

There were 2 deaths in the private group. One woman died at forty-one years of age at her second confinement, eight years after her eclampsia. She was toxic and the death was due to cerebral hemorrhage. The second death occurred four years after the eclampsia. There was no subsequent pregnancy and death was due to tuberculosis. One other patient is in the last stages of consumption but is still alive, four years after her only confinement. Five patients have hypertension but are otherwise well. One of these is fifty-four years of age and in the twenty-seven years since her eclampsia has had one normal pregnancy and labor. The second one is forty-seven years of age and in her twenty-one post-eclamptic years she has had two normal labors, two spontaneous abortions

and one toxic pregnancy with live child. The third hypertension patient is thirty-four years of age and in her five post eclamptic years has had one normal labor, one toxic labor, with a live child, and is now again pregnant. Last year she had pellagra. In the fourth case of hypertension the patient has had one induced labor with a stillborn child in her five post eclamptic years. The fifth hypertension patient has not been pregnant in her three post eclamptic years. It is interesting to note that all 5 patients had antepartum eclampsia.

An analysis of twenty-seven private cases with a history of eclampsia gives a similar picture except for the deaths. Two gave a history of two attacks. There were thirteen (27.1 per cent) post eclamptic toxic pregnancies; two post eclamptic stillbirths and neonatal deaths and seventeen (34.7 per cent) post eclamptic abortions and miscarriages. Five of these were induced. The forty-nine post eclamptic pregnancies produced thirty (61.2 per cent) live babies. The 14 pre eclamptic pregnancies yielded 12 (85.7 per cent) live babies, one stillbirth and one abortion. The total yield of live babies was 57 in 93 pregnancies or 61.3 per cent. A combined total for the two groups was 212 pregnancies with 131 live births or 61.3 per cent. Four patients were found to have high blood pressure and one of these had apoplexy.

An analysis of the clinic cases is less satisfactory because of imperfect data. For instance, the chart of the white cases shows 9 post eclamptic abortions in 25 post eclamptic pregnancies. These were all in one case. The explanation is that this is the only patient that I have been able to follow personally. For the same reason it is futile to try to study the fetal deaths. The figures obtained from the birth certificates on file at the Health Department and those obtained from the clinical histories show an entirely different proportion of live births and neonatal deaths. Among the white clinic patients, one (4.5 per cent) had 2 attacks of eclampsia. There were 3 deaths as follows:

One, at twenty years post eclamptic, of cardiorenal disease. This patient began her childbearing career with an attack of postpartum eclampsia at twenty years of age. She then had 3 normal labors with live babies. At twenty-seven years of age, she began to have a series of 9 abortions. The last 3 were induced on account of preeclampsia. The last two years of her life she suffered from headaches, and irregular uterine bleeding. She had a blood pressure that was always above 200 and an enlarged heart, enlarged liver, and a subinvolved uterus. The second death occurred at thirty-nine years, five years post eclamptic, from preeclampsia and apoplexy, one normal pregnancy having intervened. This was the patient's only supervised pregnancy. In her other pregnancies she had only a midwife. The third death occurred at twenty years, three years post eclamptic, from toxemia.

One patient attempted to commit suicide recently. She is thirty-six years old and is pregnant for the ninth time. Since her eclampsia, seven years ago, she has had two normal labors, and one labor induced on account of toxemia.



The 27 colored cases yielded the following results:

One patient had two attacks of eclampsia and one, 4 attacks. There were 5 deaths: One of pulmonary tuberculosis and maniac depressive insanity, eleven years post eclamptic. The second death was due to tuberculosis and occurred the year after the convulsions. The third death was attributed to acute yellow atrophy of the liver. In the eleven post eclamptic years, this patient had four pregnancies and labors normal in every way except for one stillbirth, and one toxic pregnancy with live birth and was four months pregnant at the time of her death. The fourth death was due to chronic nephritis and hypertension, one year after her second attack of eclampsia. The patient was pregnant at the time of her death. The fifth death was also due to nephritis, associated with cardiac hypertrophy. It occurred the next year after her eclampsia.

#### DISCUSSION

Naturally one's first concern is the likelihood of recurring toxemia. Seven per cent of the private groups had two attacks of eclampsia. Among the twenty-two white clinic cases there was one case of recurring eclampsia and among the 27 colored patients there were 2 cases. One of these had four attacks. In the 4 groups, there was a total of 118 cases that had been followed for at least three years with 9 cases of recurring eclampsia or 7.6 per cent. Peckham found 3 second attacks of eclampsia in 74 post eclamptic women studied at Johns Hopkins and Sym had exactly the same figures in a study in London. At the Chicago Lying-In, Greenhill traced 60 post eclamptics, and in the 18 pregnancies that followed, there was one attack of eclampsia. Bund found that 20 per cent of the Marburg Clinic survivors had eclampsia subsequently. It is possible that the length of time that these patients were followed may explain the differences in the figures. In my cases from one to eleven years elapsed between the attacks with an average of four and six-tenths years. The negro woman who had four attacks, had her second attack five years after the first one, her third attack eleven years after the second and her fourth attack two years after the third attack. There were 43 subsequent pregnancies in the private group and seven (16.3 per cent) were toxic. In the group of patients who gave a history of previous eclampsia, there were 13 (27 per cent) post eclamptic toxic pregnancies. In Sym's cases, 40 per cent of the 42 post eclamptic pregnancies showed signs of late toxemias of pregnancy. In the Johns Hopkins' group, 25 have been delivered since and only 11 went through a normal pregnancy and labor.

Five or 13.3 per cent of my private group now have hypertension and 14.8 per cent of the cases with a history of eclampsia. One of the latter has had a slight stroke of apoplexy. The remaining eight are in good health with the exception of the fifty-four year old patient who has frequent headaches. To this picture should be added the four toxic deaths and the three deaths from cardiorenal disease, as well as the case of maniac, depressive insanity in which the patient died of tuberculosis

and possibly, also the threatened suicide. One-half of the 60 cases that Nevermann reports had some of the following symptoms: headache, weakness of memory, visual disturbance, edema, hypertension, cloudy urine or albumin and casts and three had frank severe chronic nephritis. Of Greenhill's 60 cases, 2 patients died within three years of chronic nephritis and 3 had chronic nephritis at the time he prepared his report. Ten per cent of Bund's patients had chronic nephritis.

In reviewing the private groups, one is struck by the number of abortions, miscarriages, neonatal deaths, and stillbirths. A total of 212 pregnancies yielded 61.3 per cent live births. Ninety-seven post-eclamptic pregnancies yielded 64.9 per cent and 40 anteeclamptic pregnancies yielded 70 per cent live births. As a control, I studied the histories of the 155 private patients now under antepartum treatment. This is not quite a fair sampling for many of these patients were referred because of previous dystocia and several came because of repeated abortions. These patients gave a history of 190 pregnancies with 45 (23.7 per cent) abortions and 21 (11 per cent) neonatal deaths and stillbirths. The yield in live babies was 124 or 65.2 per cent. In Sym's cases, 60 post-eclamptic labors produced 48 live babies or 80 per cent. It would seem therefore that the immediate risk to the child is greatly enhanced when there is toxemia present. In the labors following uncomplicated pregnancies even if there be a history of eclampsia, the risk to the baby is a normal one. When eclampsia actually occurs, the risk to the baby is much greater. However, the children that survive the puerperium, have according to Bund as good an outlook as any other. He reports one child born of an eclamptic mother who in turn had eclampsia when she was confined. So far as I know, only one child in my series, born during eclampsia, has arrived at motherhood and her pregnancy and labor have been normal.

Among the white patients one died of tuberculosis and one is nearly dead of that disease. Two of the colored patients died of tuberculosis. In order to form some idea as to how many deaths from tuberculosis one should expect in such a group, I divided the 171 patients who survived the eclampsia, whether I was able to trace them or not, first into white and colored. I then grouped them into ages. For instance a fifteen year old patient who had eclampsia 10 years ago was classed as 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 years. Mr. C. E. Hayward, Registrar of the Richmond Bureau of Health worked out for me the death rates per 100,000 from pulmonary tuberculosis among white females and colored females by age groups for the City of Richmond for the years 1920-24 inclusive. Table I shows this data grouped together.

It is thus seen that the actual number of deaths from tuberculosis among those who could be found, is decidedly greater than what one would expect for the whole group of 171 females. It is realized of course that the group is too small to justify any conclusions on this

point. It is interesting to note in this connection that Acosta-Sison found two cases of active tuberculosis in 38 autopsies on women dying of eclampsia.

TABLE I

AGE GROUPS	WHITE			COLORED		
	NUMBER	AV. RATE	EXPECTANCY	NUMBER	AV. RATE	EXPECTANCY
15 to 20	84	4.4	0.00370	120	48.5	0.01455
20 to 25	184	15.6	0.02870	166	71.2	0.11819
25 to 30	207	15.1	0.03126	81	63.0	0.05103
30 to 35	146	10.7	0.01562	47	33.0	0.01551
35 to 40	81	6.4	0.00518	30	25.8	0.00774
40 to 45	52	7.3	0.00380	32	20.6	0.00659
45 to 50	23	7.8	0.00179	7	15.5	0.01109
Over 50	22	9.8	0.00216			
Total	799	77.1	0.09221	483	277.6	0.22470

## SUMMARY

In 49 clinic cases, 37 private cases followed for at least three years and 27 private cases who gave a definite history of eclampsia, recurring eclampsia was found in 7.5 per cent.

From 16 per cent to 27 per cent of post eclamptic pregnancies were toxic.

The yield of live births per pregnancy is somewhat less after eclampsia than normal, but this can be satisfactorily accounted for by the number of toxic pregnancies that one finds at this time.

Upwards of 13 per cent of the private patients were found to have hypertension.

There were four deaths from toxemia in post eclamptic pregnancies and three deaths from cardiorenal disease in the 86 cases that were followed for three years or more. The "expectancy" for the whole group is 0.8.

More tuberculosis occurred in this group than one would naturally expect.

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(For discussion, see page 282.)

## AN EIGHT MONTHS' EXTRAUTERINE PREGNANCY CALCIFIED AND RETAINED FOR FORTY YEARS\*

BY PAUL TITUS, M.D., AND J. R. EISAMAN, M.D., PITTSBURGH, PA.

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THE comparative rarity of such a case as this probably is sufficient warrant for its being reported. In this particular instance, however, certain features of the diagnostic study of the patient present such unusual aspects as also to merit some attention on this account.

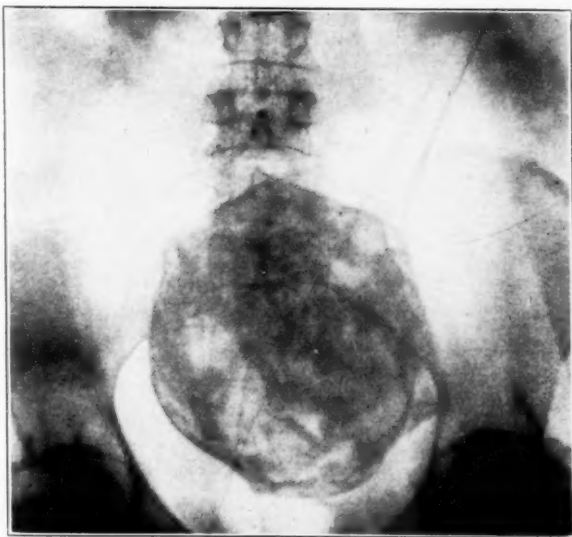


Fig. 1.—Calcified tumor mass containing fetal bones.

*History.*—The patient, Mrs. M. B. (Hosp. No. 2117), a negress, aged sixty-four. She was admitted to the Gynecological Division of the St. Margaret Memorial Hospital October 24, 1930, with symptoms of partial intestinal obstruction. A tumor mass was palpable in the lower abdomen extending 10 cm. above the symphysis and deep into the pelvic cavity. She stated she had had one normal delivery and that in 1890 she had become pregnant again. At eight months fetal movements ceased, at the same time she thought, because of some painful uterine contractions with vaginal bleeding, that her labor had begun. The bleeding lasted two weeks and then ceased after which time she menstruated regularly until her menopause a number of years later.

The large mass in her abdomen did not disappear and from time to time gave her considerable discomfort from pressure.

\*The illustrations in this work were prepared under a grant from the John C. Oliver Memorial Research Foundation at the Hospital.

She related that her doctors told her, however, that this baby would either "putrefy or petrify" and that if it "putrefied she would die while if it petrified she would be all right," so as she put the matter, there was "nothing to be done



Fig. 2.—X-ray after injection of uterus with iodized oil; demonstrating extrauterine and extratubal location of mass.

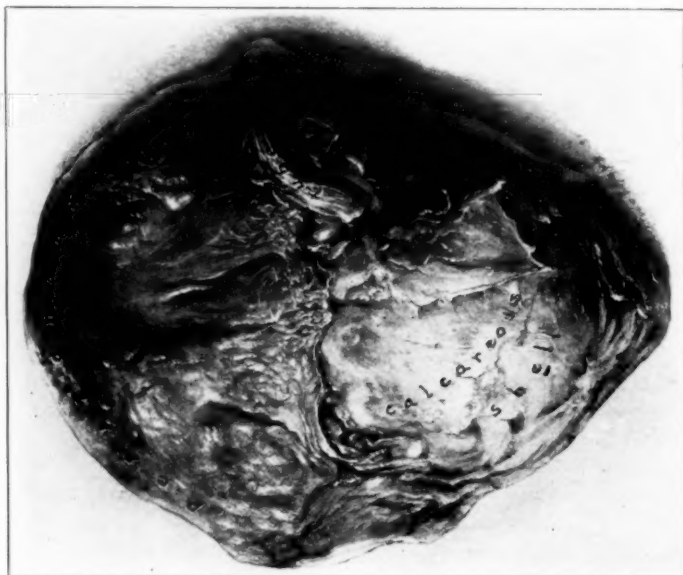


Fig. 3.—The tumor mass after removal.

about it." Her first husband died and presently she married again. The couple grew old together, and she became totally blind from cataracts. At the time of her admission at sixty-four years of age she was greatly overweight, with blood





Fig. 4.—X-ray of excised mass.

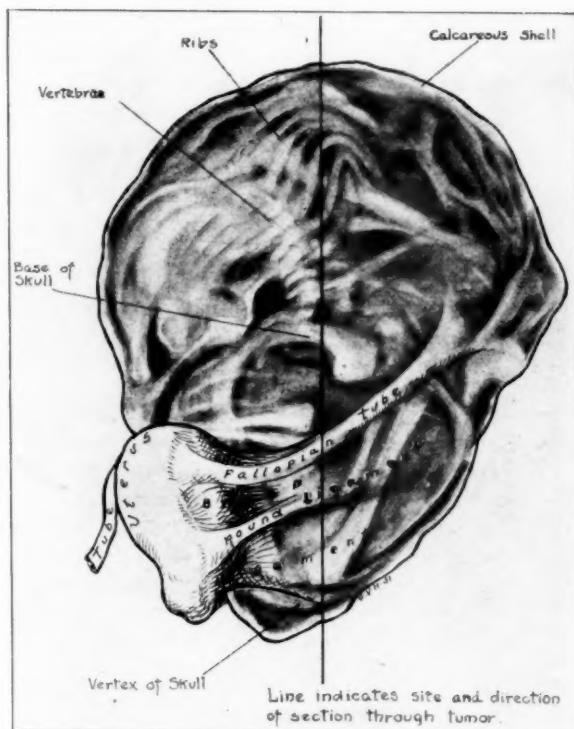


Fig. 5.—Schematic reconstruction of operative findings and relations. (Vertical line shows direction of incision for dissection.)

pressure 190/110, and albumin and pus in her urine, while for some months previous to her admission she had been showing signs of partial intestinal obstruction with increasing pain and discomfort.

Her physician, Dr. J. E. Brown, who referred her to us made a tentative but accurate diagnosis from her history and the palpatory findings, of tumor formation due to pregnancy and failure to deliver.

The logical conclusion was that this was an abdominal or tuboabdominal pregnancy because the gestation had advanced to eight months, and after its interruption by death of the fetus she had menstruated normally. It was of interest to establish this accurately, however, so that a thorough x-ray study was undertaken.

The first picture showed a calcified tumor mass containing fetal bones. (Fig. 1.) The uterine cavity was then injected with iodized oil according to the technic devised by Cary,<sup>1</sup> and this x-ray film (Fig. 2) shows the uterus situated to the right of the mass with the left tube extending along the anterior lower surface of the mass and disappearing into its left side.

This would indicate that we were dealing with a tuboabdominal pregnancy rather than a broad ligament extraperitoneal pregnancy as described by Williams<sup>2</sup> because the tube was low on the mass rather than high, and seemed to extend into it. Later, on sectioning the tumor no remnant of the placenta could be found so that the point of its attachment is entirely a matter of conjecture.

She was operated upon on October 28, 1930 under intravenous sodium amytol and nitrous oxide-oxygen anesthesia.

The tumor mass was firm and calcareous and densely fixed in the pelvic cavity. Posteriorly and on the left side it was bound down by innumerable adhesions which were freed by manual dissection. Under clamps its pedicle attachment consisting of the left fallopian tube and a portion of the broad ligament was divided. It was then seen that the bed of the tumor was, as previously diagnosed, on the posterior surface of the left broad ligament. This bed which oozed freely was closed with mattress sutures and the severed end of the tube was quickly ligated and buried beneath the left round ligament. Both ovaries showed senile atrophy and no pathologic changes.

Several omental adhesions were ligated and divided. The sigmoid though involved in the adhesions of the tumor bed was not torn, but did ooze freely. This was controlled by application of hot pads.

The tumor mass when removed measured 14 by 11 by 9 cm. and presented a rough stony shell.

The patient was greatly distended with gas and vomited from the outset after operation. Repeated gastric lavage and proctoclysis by the Harris tidal wave method, as well as prolonged venoclysis of dextrose and salt solution gave encouraging results but on the fifth day the ileus was again more marked. During the administration of spinal anesthesia to relieve the ileus she suddenly died.

The autopsy findings, in addition to chronic myocarditis and mitral and aortic endocarditis, arteriosclerosis, cholecystitis with stones, and acute nephritis, were as follows, "the stomach was dilated . . . . and the small intestine throughout practically its entire extent was several times its normal diameter; some loops were discolored and the wall was thinned suggestive of a paralytic ileus. A small amount of fibrinous exudate and here and there red adhesions . . . . the appendix and cecum were also involved in a beginning peritonitis. The area along the left lower abdomen where the tumor had been removed showed a puckered suture and completely covered raw surface. The surgical closure of the area was perfect."

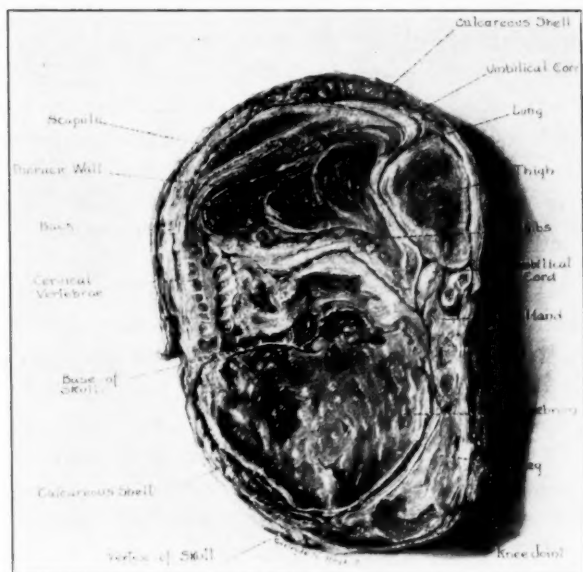


Fig. 6.—Left half-section of incised mass.

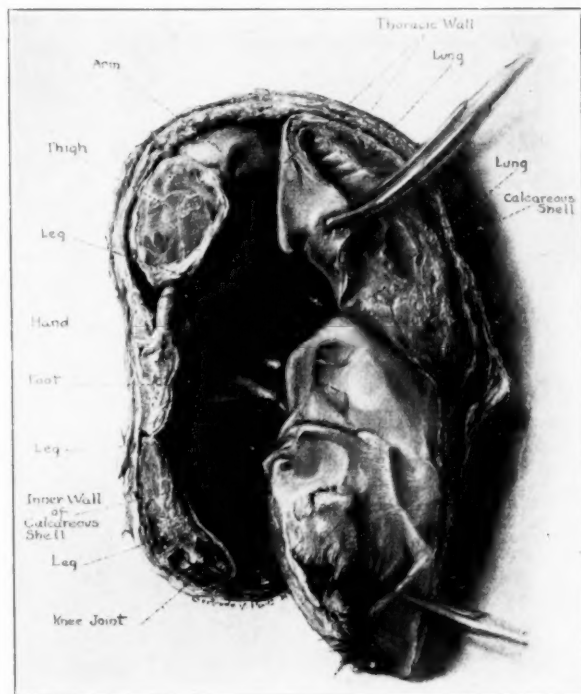


Fig. 7.—Right half-section of mass with partial removal of contents to show relations.

## HISTORICAL

Under the subject of lithopedion DeLee<sup>3</sup> states in his textbook "Wagner had a case where a mummified fetus was carried for twenty-nine years, and Virchow one for twenty-eight years. Smith describes a calcified fetus which was removed from a woman ninety-four years old sixty years after conception." He also says that "suppuration may occur at any time even after calcification is marked," and that many cases have been reported.

## SUMMARY

The outstanding points of this case briefly summarized are (1) that an abdominal pregnancy of approximately eight months' development became calcified and was carried as a tumor for forty years, (2) that an accurate diagnosis of the condition itself was made in advance of operation by x-ray which showed fetal bones within a calcified shell, (3) that by injection of the uterine cavity and the fallopian tubes with iodized oil the location of the fetal mass was determined by x-ray as being outside the uterus and tubes, a diagnosis of extrauterine pregnancy thus being established in advance. Visualization of uterus and tubes by x-ray after injection is a relatively new procedure supplementing Rubin's tubal insufflation test, and we believe from a brief search of the literature that this may be the first time that there has been an opportunity for the same procedure to be used for the diagnosis of abdominal pregnancy.

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1015 HIGHLAND BUILDING

(For discussion, see page 288.)

## CARCINOMA OF THE UTERUS COMPLICATED BY TUBAL GESTATION

BY STEPHEN E. TRACY, M.D., F.A.C.S., PHILADELPHIA, PA.

**C**ARCINOMA of the cervix uteri complicated by normal gestation while not a frequent association, has been referred to repeatedly in the literature and is recognized as a most serious complication. On the other hand, carcinoma of the cervix uteri associated with tubal gestation is a rare condition and is not even mentioned. It is a condition even more hazardous than carcinoma of the cervix complicated by a normal gestation.

Batisweiler reported a case of ectopic gestation with cancer of the cervix in a woman thirty-seven years of age, who had had three normal deliveries and one abortion. In the course of a radical Wertheim operation, an ectopic gestation was discovered in the right tube. The histologic study of the tissue confirmed the clinical diagnosis.

Dertchinsky also reported a case of cervical cancer in connection with ectopic gestation. The patient entered the clinic Dec. 30, 1925. She was thirty-two years of age and had had six pregnancies, five of which were normal while one terminated during the eighth month. Her last menstrual period was on Dec. 8, 1925. On vaginal examination the cervix was found dilated, hard and tubercular. The uterus was firm and somewhat enlarged. The appendages, especially the right one, were enlarged, painful, and only slightly movable. Zweifel's modification of Wertheim's operation was performed January, 1926. A small quantity of freshly coagulated blood was found in the abdomen and pelvis, and there was a small hemocele in the right tube. The diagnosis of the lesion was confirmed by the histologic study.

Rech reported a case of tubal gestation in connection with carcinoma of the cervix in a patient forty-three years of age, who had given normal birth to eleven children, and had an abortion two and one-half years before the present illness. Vaginal examination revealed a carcinoma of the cervix. During the operation there was discovered a right tubal gestation.

Pokrowski reported a case of tubal gestation in connection with a carcinoma of the cervix uteri in a patient twenty-six years of age, who was admitted to the clinic Jan. 14, 1906. She had had one normal delivery. The last menstrual period was two weeks before admission. A panophorosalphingohysterectomy was performed. There was a right tubal gestation.

Kimura reported a case of carcinoma of the cervix uteri with a right tubal gestation in a patient thirty-six years of age, who had had three normal deliveries. The anterior lip of the cervix was hypertrophied and slightly eroded. On the posterior lip a bleeding ulcerated erosion was observed. The right tube was swollen to the size of a hen's egg and adherent to the uterus. The preliminary diagnosis was incipient cancer of the cervix uteri, complicated by a right adnexal tumor. The treatment was a radical hysterectomy. It was Kimura's opinion that the growth of the cancer was much accelerated by the ectopic pregnancy.

Hirschberg reported a case of carcinoma of the cervix uteri with a left tubal gestation. The patient was thirty-two years of age. Menstruation began at the



age of seventeen. The quantity was normal, but the periods were irregular. The last period was fourteen days prior to examination.

There had been two abortions, but no fullterm deliveries. The last abortion was seven years ago. The patient had complained of pain in the left side of the lower abdomen and back for three weeks. A radical Wertheim-Zweifel operation was performed, and a tubal gestation was found on the left side. There was a pavement epithelium carcinoma of the cervix uteri.

Tubal gestation in the presence of carcinoma of the corpus uteri is an even more unusual combination. A rather extensive search of the literature failed to reveal a single report of such a case in the published indices. In this connection the report of a case is of interest.

Mrs. E. B. came under observation Jan. 3, 1929. Menstruation was established at the age of thirteen years. The periods were regular, of eight days' duration, and of the thirty-day type. The patient gave a history of four normal pregnancies, with fullterm spontaneous deliveries. Three and one-half years ago she was operated upon for a left tubal gestation. The last normal pregnancy antedated the ectopic gestation about seven years. The last menstrual period was Nov. 15, 1928.

On December 15, the menstrual flow was scanty, and lasted only two days. It recurred every two or three days, but was a mere spotting. This condition continued until November 30, when the patient suddenly experienced a sharp shooting pain in the lower abdomen which lasted about one-half hour. This was followed by a mild vertigo. The following day she had a similar attack of longer duration.

Examination of the abdomen was negative. Vaginal examination showed a good perineum and a normal cervix. The left ovary was normal. There was considerable tenderness on the right side, but no pathology could be detected. Rectal examination was negative except for tenderness in the right side of the pelvis. The following day a second pelvic examination was made under gas anesthesia, with similar findings. A thorough investigation eliminated the renal system. A diagnostic dilatation and curettement was done, and a rather large amount of suspicious-looking material was removed. The pathologist reported an adenocarcinoma of the corpus uteri, which diagnosis was confirmed independently by another pathologist.

On January 11, 1929, when the peritoneal cavity was opened, there was found considerable free dark blood. The omentum was adherent to the former incision. The right appendage was attached to the side of the sigmoid, and when delivered was found to be slightly enlarged and was suspicious of an ectopic gestation. When the fallopian tube was incised a very small fetus was revealed.

In view of the fact that the pathologist's diagnosis had been confirmed, a pan-hysterectomy was performed. The patient had a normal convalescence, and was discharged in good condition. Histologic study of the uterus confirmed the diagnosis of adenocarcinoma of the corpus uteri located slightly above the internal os. The tube showed a salpingitis with ectopic gestation.

Ectopic gestation in the presence of carcinoma in any part of the uterus is a rare complication. Only six cases of carcinoma of the cervix uteri associated with tubal gestation could be found after a rather extensive search of the literature. In all of these six cases the malignancy was recognized, but in not a single case was the diagnosis of tubal gestation made prior to operation.

Ectopic gestation in the presence of carcinoma of the corpus uteri seems to be almost incompatible, as no previously reported case could

be found. The malignancy in the case reported was apparently early and developed slightly above the internal os. Had the malignancy been higher in the endometrial cavity the uterine ends of the tube would have been blocked from the overgrowth of the tissue, and it would have been impossible for the spermatozoa to have entered the tube.

In this case, although the history was suggestive of an ectopic gestation, the association of a tubal gestation was not even considered when the malignancy was discovered, as such a combination was unknown.

It does not seem possible that this is the only case of its kind. There have probably been other cases which have been overlooked or not reported. As in the cases of carcinoma of the cervix complicated by tubal gestation, the diagnosis of the tubal pathology was not made until after the celiotomy.

Cases of gestation associated with carcinoma of the cervix uteri have been reported in which the patient improved greatly during gestation, only to suffer a relapse and die a short time later.

There is no doubt that the growth of a carcinoma in any part of the uterus is accelerated by gestation. This being the case radical treatment should be instituted as soon as the malignancy is recognized.

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1930 CHESTNUT STREET

(For discussion, see page 287.)

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**Brindeau, A.**: Spontaneous and Permanent Dilatation of the Cervix During Pregnancy. Bulletin de la Société d'Obstétrique et de Gynécologie, Paris, 1928, No. 4, p. 350.

The author reports three rare cases in which there was true effacement and extensive dilatation of the cervix during pregnancy unaccompanied by painful contractions or uterine overdistention. One patient was carefully examined for her reflexes and sphincter activities but the reflexes were normal and there was no paralysis of the sphincters.

J. P. GREENHILL.

## ABDOMINAL INCISIONS

By E. P. SLOAN, M.D., BLOOMINGTON, ILL.

ABDOMINAL incisions of all kinds heal so kindly and from the standpoint of the visible scar are so satisfactory, that it may seem as if the type of incision used is of little importance. If the incision heals promptly and the external appearance of the scar is satisfactory, we are prone to ignore the incision as the cause of late distressing symptoms. Careful consideration of the remote as well as of the immediate results following all muscle-cutting incisions will show that a scar becomes weaker as the years go by and that adhesions form under the scar in the majority of cases. The only support usually found across the old abdominal scar at the second operation is by a few fascia fibers connecting the edges of the anterior rectus sheath. The muscles and the posterior sheath being separated by a considerable interval filled with omentum, a portion of the stomach, transverse colon, small intestines or the sigmoid all adherent to the under surface of the scar. This is, of course, to be expected within one to five years following drainage or infection but the same conditions are usually found ten to fifteen years after clean abdominal incisions that are closed without drainage and that heal by first intention. According to Boeckmann<sup>1</sup>, Abel's statistics from German clinics showed 8.9 per cent hernias after longitudinal incisions with healing per primam and 31 per cent after healing per secundam. Abel's statistics, however, covered only a period of five years subsequent to operation. The incidence of hernia would undoubtedly have been shown to be much larger had his statistical period been twenty years.

It seems to be generally accepted that the incidence of hernia following vertical incisions when large drains are used or when infection occurs is large. The high incidence of hernia or at least of a weak scar five, ten, or more years after all muscle-cutting abdominal incisions is not so generally recognized.

Out of 239 cases of postoperative hernia that came under my observation, the hernia followed operation in 93, at which large drains were left in the incision. In 41 of these 93 cases the hernia appeared within two years after operation, in 22 within five years and in the remaining 30 after periods of from five to sixteen years had elapsed. In 103 of the 239 cases a small drain such as a small tube to the gall bladder region had been left at the previous operation. The hernia was discovered within five years subsequent to the operation in only 4 of these cases. The incision had been closed without drainage and had healed by first intention in the other 99 of the 239 cases. The hernia became evident in

9 of these cases in the sixth year, in 19 in the seventh year, in 24 in the eighth year, in 21 in the ninth year, in 14 in the tenth year and in 12 after a period of more than ten years had elapsed since the operation.

During the same period of time 128 patients with no external evidence of hernia were subjected to operation five or more years subsequent to an upper abdominal operation with a vertical incision. A strong satisfactory union across the old incision with union of the posterior sheath of the rectus was found in only 9 of the 128 cases. In the other 119 of them, although no evidence of hernia could be discovered by external examination, it was disclosed at operation that the entire support across the old incision consisted of only a thin layer of fascia fibers connecting the edges of the anterior sheath of the rectus.

The high incidence of postoperative adhesions to the inner side of the scar is of more consequence than the danger of hernia. Adhesions to the under surface of the scar were absent in only five of the 367 cases already mentioned. Some other factor than imperfect closure must be responsible for the high incidence of postoperative adhesions, as many cases are seen with a strong apparently perfect scar but with massive adhesions under it.

The destruction of the trophic nerve supply to the structures between the incision and the median line has been considered by many investigators as a possible factor in the production of these adhesions. Although it is true that after a period of years the fasciae is found to be atrophied between a vertical incision that severs the nerves and the median line, the adhesions are certainly present soon after operation and long before the effect of this disturbance of the trophic nerve supply is operative. It seems to me that the presence of these adhesions is much better explained as due to the irritation of the peritoneum from the tension placed upon the sutures in the posterior sheath near or through the peritoneum. Evidence in support of this theory is furnished by the fact that the incidence of adhesions following clean operations below the semilunar fold of Douglas is a fraction (perhaps 15 per cent) of that following operations above the fold.

The old rule that the danger of hernia with longitudinal incisions increases in proportion to the square of the length of the incision seems to be borne out in our experience. According to this rule if in a given number of operations with 3-inch incisions there would be 9 hernias, with 4-inch incisions there would be 16 and with 5-inch incisions there would be 25. Of the patients that we have seen with 10-year-old scars from upper abdominal incisions over 80 per cent of those with 5-inch scars and 60 per cent of those with 4-inch scars and 27 per cent of those with 3-inch scars have had some appreciable and demonstrable weakening of the abdominal wall at the site of the old incision.

Close and accurate suture of the peritoneum and skillful closure of the muscles and aponeuroses cannot relieve the stitches from tension, espe-

cially when the intraabdominal tension is increased by coughing, vomiting, or straining. The tension thrown directly upon the stitches or sutures holding the ends of the severed transverse aponeurotic fibers together is enormous.

A few years ago we attempted to measure the force required to hold ends of the severed transverse fibers together while the patient was struggling under light anesthesia. By means of spring balances attached to mouse-tooth forceps we were able to accurately measure the force required to hold the edges of an incision together. We found that the longer the vertical incision the more force per inch of incision is required to bring the edges together. The force required increases in proportion to the square of the length of the incision. Thus, with a patient lightly anesthetized and coughing or struggling, about ten pounds of pull on each side is required to hold the edges of a three-inch incision together. If the incision is lengthened to four inches it will require eighteen pounds and if lengthened to five inches it will require about forty-five pounds on each side to hold the edges of the incision together. Therefore, we seem justified in formulating the following rule: *The lateral pull upon the suture line following a vertical abdominal incision and the incidence of postoperative hernia are in proportion to the square of the length of the incision.*

By the same procedure, with a Sprengel transverse incision in which the rectus muscles were cut transversely, we measured the slight amount of force required to hold the edges of the incision together, but the relative vertical and transverse abdominal tension on different patients did not furnish dependable data for an accurate comparison. To be of value the vertical and transverse tension must be measured under the same conditions and on the same patient. This was done by measuring the force required to hold together the transverse and vertical portions of an L-shaped incision, one side of which was vertical and one transverse. These measurements, carefully obtained in 20 cases, showed that the lateral tension was in every case fully thirty times as great as the vertical. It seems that the extreme transverse tension may explain the almost complete certainty that weakening of the abdominal wall and hernia will ultimately follow a vertical incision. Recognition of the high incidence of postoperative adhesions and hernia following vertical incisions and the urgent need for their prevention have stimulated much research work on this problem.

*Lower Abdominal Incisions.*—In 1896 Küstner<sup>2</sup> proposed the transverse incision in the lower abdomen. In 1900 Pfannenstiel<sup>3</sup> presented his combined transverse and longitudinal incision that almost entirely eliminates the danger of hernia in pelvic operations. Its advantages were recognized, and it was in routine use by many men in the United States during the period of 1900 to 1909. Following Boeckmann's presentation of the literature extant and the reported results in 1909, it



came into more general use. Since that time, it has been used routinely in our clinic. We are convinced that from the standpoint of the patient's welfare it is far superior to the longitudinal incision. The dangers of postoperative hernia and of separation of the wound margins are eliminated. The convalescence is shortened and postoperative discomfort is markedly lessened. It affords ample room for all operations in the lower abdominal region. The nerve supply of the abdominal wall is not interfered with. It is easily closed and followed by almost no danger of postoperative hernia.

*Appendectomy Incisions.*—The right rectus incision for appendectomy that is closed without drainage and that heals by first intention is seldom followed by hernia if the incision is a short one and located below the level of the semilunar fold of Douglas. If the incision extends upward and the transverse fascia fibers that terminate in the semilunar fold of Douglas are severed, the incidence of hernia is greatly increased. This is easily explained by the fact that greater tension is placed upon the fibers that constitute the semilunar fold of Douglas than upon any other transverse fibers in the abdomen. In no other location is a longitudinal incision so liable to be followed by adhesions under the scar. The tension placed upon the sutures in the posterior sheath near the peritoneum by coughing, vomiting, or abdominal distention seems to be a logical explanation for this fact.

A muscle-splitting incision similar to the McBurney incision but placed just inside the iliac spine permits direct access to the meso-appendix without displacing loops of the small intestine mesially or rotating the head of the cecum. A muscle-splitting incision in this location affords an opening at least two and one-fourth inches in diameter and immediately over the base of the appendix. The appendix especially when retrocecal can be removed with greater ease through this incision than through a right rectus one. In not more than one-fifth of one per cent of cases is the anatomical situation of the appendix such that any difficulty is encountered in its removal on account of the limitations of this incision.

*Upper Abdominal Incisions.*—Oblique incisions and many variations of the longitudinal incision were proposed but no incision was suggested that preserved the transverse fibers and the nerve supply until 1910.

In 1910 Sprengel<sup>3</sup> published the description of a transverse incision for operations in the upper abdomen that seemed to promise relief from the tragic consequences of the longitudinal one. Many operators in this country adopted it for a time. It has undeniable advantages over the longitudinal one. It affords ample room for access to all organs in the upper abdomen. The nerve supply of the structures in the abdominal wall is not interfered with. It is easily closed and according to some authorities its use is accompanied by almost no danger of postoperative hernia or of postoperative adhesions. In our experience the danger of

postoperative adhesions is lessened if not entirely eliminated but the same cannot be said of hernia. If a rectus muscle is divided at the level of a transverse striae, union will be firm and followed by little or no danger of hernia. The striae however are seldom at the same level on both sides and if a muscle is divided between the striae the section of muscle from the point of the division to striae above and to one below will atrophy with weakening of the scar and hernia. The hernias that in our experience followed the use of this incision occurred in every single case on the side that the muscle was severed between the transverse striae. The almost universal feeling that such large important muscles as the recti muscles should not be severed if their continuity can be preserved perhaps accounts for the fact that this incision has not come into more general use.

In 1915 McArthur<sup>4</sup> described a combined vertical and transverse incision for gall bladder operations. The usual longitudinal incision is made through the right rectus muscle. The muscle is separated from the posterior sheath and the fibers of the aponeurosis of the transversalis are separated transversely. This incision is ideal in every respect for a cholecystotomy. It does not provide ample room for more extensive procedures.

A new incision for all operations in the upper abdomen was developed in our clinic in 1922. This incision preserves the rectus muscles, all of the fibers of the posterior sheath and does not destroy any of the nerve or blood supply of any of the structures in the abdominal wall. It is easily made and gives ample exposure for all operations in the upper abdominal region and permits an approach to the appendix. An illustrated description of this operation and a report by Dr. G. A. Sloan from our clinic of its use in 114 cases appeared in the November issue, 1927, of *Surgery, Gynecology and Obstetrics*. Since that time it has been used in our clinic 314 times. It is of especial advantage in the presence of sepsis and when the institution of drainage is indicated. In 147 of these 314 cases, 29 of which were "septic cases," drainage was instituted through the transverse incision of the posterior sheath and a stab wound through the rectus muscle, anterior sheath and skin. In 27 cases the drainage was instituted through stab wounds placed above the incision. In 11 cases of perforation from ulcer of the stomach the drainage was brought out at the inner edge of the rectus through this incision. In 15 cases the drainage continued for more than five weeks. More than three years have elapsed since 114 of these patients were operated upon and in the entire series only 3 hernias have developed. In these 3 cases the hernia occurred at the point where a large drain had been left for a considerable period of time. In each case the hernia was as easily closed under local anesthesia as a small umbilical one.

An opportunity to explore the under surface of the scar has been afforded in 9 of these cases. In only 2 out of the 9 cases were any ad-

hesions present and in these 2 cases the adhesions were omental ones and slight in extent.

The postoperative complications that so often follow upper abdominal operations are almost entirely obviated by the use of this incision. The statement by McArthur that "the transversalis is an active respiratory muscle and following a longitudinal incision, with each respiration it so tugs and pulls on the line of sutures as to make it give away" seems to be supported by the fact that the fibers of the transversalis are not severed in making this incision and that postoperative respiratory complications are rare. The pain and discomfort incident to coughing, wrenching or abdominal distention are greatly minimized. The patient can turn in bed or even raise himself to a sitting position without pain from increased tension upon the sutures in the incision. Less narcotics and sedatives are required following operation, more freedom of motion may be permitted, the convalescence is shortened and a better skin scar with less deformity is secured than is possible with a right rectus or transverse incision.

*Description of the Incision.*—1. An incision through the skin and subcutaneous tissue is made in the linea alba from the ensiform to a point 3 or 4 cm. above the umbilicus. The incision is extended around the umbilicus on each side and continued downward and over the recti muscles to a point slightly below the umbilicus leaving a V-shaped piece of skin and subcutaneous tissue around it. The skin and fat are dissected outward on each side until the aponeuroses over the inner borders of both recti muscles are exposed.

2. The anterior sheaths of the recti are incised vertically about one centimeter lateral to the inner borders of the muscles. The extent of the exposure obtained depends upon the length of these two incisions.

3. The recti muscles with their firmly attached flaps of the external sheath, fat and skin are rolled outward and held by suitable retractors widely exposing the posterior sheaths of both recti muscles. A transverse incision is made at the level desired through the exposed posterior sheath of the rectus and the peritoneum and extended across the linea alba parallel to the direction of the fibers from the outer edge of one rectus muscle to the outer edge of the other. Additional retraction upward and downward enlarges the opening to a surprising extent, the diameter of the opening being about equal to the length of the incisions made in the sheaths of the recti. The only blood vessels encountered in making this incision are some small subcutaneous ones, a small one or two on the surface of each rectus muscle and one or two in the falciform ligament near the linea alba. The nerve supply of no structure is destroyed.

*For Operations on the Gall Bladder.*—Retraction upward and outward exposes the region of the gall bladder, the liver, and the hepatic flexure of the colon. For cholecystectomy or cholecystotomy only the right half of this incision is usually required. For gall bladder operations one-half of the incision may be made and the transverse incision extended to the inner border of the left rectus muscle. This gives ample exposure for all operations upon the gall bladder, the common duct, the duodenum, and the pyloric end of the stomach. It usually provides room sufficient for a gastroenterostomy. Should more room be desired the incision may be extended on the other side with ease. When a cholecystotomy is performed, the drainage tube is brought out through a puncture wound and the gall bladder is brought to the abdominal wall at any point desired.

*For Appendectomy.*—Retraction of the opening downward and outward affords a better approach to the appendiceal region than is obtained by a longitudinal right rectus incision of any reasonable length.

*For Splenectomy.*—The left half of the incision is usually all that is required for splenectomy. The transverse incision should be made at a somewhat higher level than for gastrointestinal operations.

*Closure of Posterior Sheath and Peritoneum.*—The closure of this incision is quite simple as the transverse fibers have not been severed. If the closure of the peritoneum and posterior sheaths of the recti is begun at the outer ends of the transverse incision, no difficulty is experienced even with the largest and fleshiest patient, as no tension whatever is required to bring the edges together.

*Closure of the Anterior Sheath.*—The edges of the anterior sheath of the recti are brought together with No. 1 chromic catgut with surprising ease.

*Superficial Structures.*—No sutures are required in the subcutaneous layer of fat. Skin closure with skin clips is all that is required.

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(For discussion, see page 289.)

## MURAL SARCOMA OF THE UTERUS, WITH A REPORT OF 13 CASES\*

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**S**ARCOMAS are malignant mesodermal tumors locally destructive and spreading systemically to other viscera by the blood stream. In the uterus the embryonal-like stroma of the endometrium and the fibromuscular components of the myometrium furnish respectively the groups of endometrial and mural sarcoma first differentiated by Virchow. Mural tumors arising in the myometrium, are further subdivided into primary or de-novo sarcomas, and a secondary group, arising in preexisting fibromyomas. The mixed sarcoma of the uterus is an embryonal tumor to be separately considered under de-novo uterine sarcoma.

The incidence of mural sarcoma though low is of special significance since the advent of radiotherapy in fibromyoma, for sarcoma arising in preexisting fibroids comprise a large number. Figures vary with the routine care in the examination of the specimens and as recorded in the literature vary from 1 to 9 per cent. O. Frankl tabulates 38 sarcomas in a group of 1,878 fibromyomas or 2.13 per cent. Of these, 15 were primary, including 3 mixed tumors of the uterus. Seventeen

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were secondary and 5 probably began in a preexisting fibroid. One specimen obtained by morcellation was inconclusive. The Gynecological Laboratory of the Long Island College Hospital received 510 specimens removed for supposed fibromyoma of the uterus from Sept. 1, 1923, to Dec. 1, 1929. Thirteen sarcomas were encountered, an incidence of 2.54 per cent. Of these, 8 were primary tumors including 2 mixed sarcomas of the body; and 5 originated in preexisting fibroids.

The histogenesis of sarcoma has been long debated. Among early authors, Virchow and Williams in particular, considered matured and adult muscle and connective tissue cells as progenitors of mural sarcoma. More recently studies by Robert Meyer, Oskar Frankl, and James Ewing indicate a myogenic origin from immature, embryonal mesodermal rests which take on varied growth potential. Maturing forms reproduce benign muscle and connective tissue cells as in fibromyoma. Immature cell types with rapid growth tendencies present as spindle, round or giant cell sarcoma. Myoma malignum (sarcoma myomatoides) holds an intermediary position for this group comprises seemingly benign growths which, however, locally recur and occasionally metastasize. In sarcoma arising in preceding fibroids orthotopic undifferentiated cells lose their growth restraint, rapidly proliferate and replace the benign cells of the antecedent tumor. The histogenesis of mixed sarcoma is attributed to wolffian duct rests.

Primary mural sarcomas as a rule are solitary and circumscribed but encapsulation is lacking. They most frequently occur in the body; cervical types generally belonging to the mixed sarcoma group. The primary tumors favor a submucous position; the secondary sarcoma are generally interstitial but in either group, submucous, interstitial and subperitoneal forms present. Of 8 primary tumors here reported (including the mixed type) 4 were submucous, 1 interstitial but growing toward the cavity, and 3 were entirely interstitial. Of 5 arising in fibromyoma, 3 were interstitial, 1 encroached upon the cavity, and 1 was truly submucous in type. Uterine sarcomas are round or oval and though varied in size are of moderate dimension. Those recorded in this series ranged from 2 to 17 cm. in diameter. Secondary hypertrophy of the myometrium is frequent, especially in submucous growths. The endometrium overlying the tumor is congested and long preserved. In advanced stages the tumors penetrate the submucous and peritoneal layers; in the latter instance resulting in direct implantation of malignant elements upon contiguous organs. On cut section the gross appearance of the tumors varies with maturity of the component cells and secondary nutrient disturbances resulting from venous compression or thrombosis. Tumors comprised of well differentiated muscle elements and designated as myoma malignum, mask as fibroids frequently escaping the recognition of clinician and pathologist until microscopic examination is made. Dannreuther re-



cently described four such cases. Grossly these sarcomas resemble benign fibromyomatous tumors because of their sharp circumscription and whorled appearance. The loss of the silky hue, sparsity of fasciculation, the softened consistency and difficulty in shelling from the capsule, however, are differential characters. Two gross specimens in this series (17058 and 17062) were of this type. More often sarcomas are recognizable by their grey-white opaque appearance, soft consistency and friability. Hemorrhage which is frequently encountered imparts a red, brown, or blue tint to segments or the whole of the tumor. The most rapidly growing tumors are brain-like in character, yellow-grey with an irregular margin. Thrombosis is especially marked in this group resulting in irregular cavities which represent the end stage of liquefaction necrosis.

In sarcomas arising in fibroids the gross appearance in early cases is distinctive. Irregular islands of sarcomatous tissue are placed within the sharply defined capsule of the fibromyoma. The dull, opaque, homogeneous appearance contrasts sharply with the defined whorls of the preserved fibromyoma. With continued growth, however, complete replacement may occur obliterating the landmarks of the preexisting benign fibroid. But in the great majority of instances distinction is possible by: (a) a peripheral zone of fibromyoma into which strands of sarcoma can be traced, (b) preservation of the capsule in part or, (c) sharp definition of the tumor where myoma is preserved in entirety at the periphery, contrasting strikingly with the irregular border where malignancy has occurred, and (d) the silky gloss and whorled appearance of fibromyoma contrasts with the homogeneity and opacity of the sarcoma. Since fibroids are most commonly interstitial this position is most commonly preserved when secondary sarcoma appears but subperitoneal and submucous types are also met. Otherwise the gross characters of the secondary sarcomas are essentially as noted in the primary group. The mixed sarcomas are separately considered below.

Morphologically in both primary and secondary sarcoma pure cell forms are rare, mixed types the rule, so that round, spindle, and giant sarcoma cells frequently intermingle. In the primary form a purely spindle cell group exists which is deservedly designated as myoma malignum. Its component cells approach mature, smooth muscle fibers. They are large, spindle in form and arranged in parallel columns forming concentric whorls or more frequently wide, irregular, interlacing sheaths. The cytoplasm is abundant, myoglia are differentiated. The nuclei are centrally placed, short, wide and hyperchromatic. Variation in size and form is not marked. Mitoses are infrequent. Sparse numbers of undifferentiated, spindle and giant cells may, however, be intermingled. Three primary cases (17058,

17622 and 17401) were of this type although grossly only two showed characters of myoma malignum. The cervical sarcoma microscopically also presented the characters of this group. In the majority of primary and secondary sarcomas the constituent spindle cells possess greater growth potency and differentiation is less complete. The cell borders are poorly defined; cytoplasm is scant; myoglia are lacking. The nucleus is relatively large and extremely varied in shape and form which varies from spindle to fusiform or oval. Both vesicular and solid nuclear types are intermingled and mitotic figures are numerous. Yet the tendency for grouping of the component cells in intertwining sheaths is persistingly recognizable indicating the myogenic origin. Admixtures of small spindle, round, fusiform, polymorphous and giant cells are encountered in varying proportions. Blood vessels are plentiful and though of the capillary type are of sinusoidal dimension. Thrombosis results in large areas of necrosis. In this series of thirteen cases, seven reproduced this anaplastic cell pattern, two belonging to the primary and five to the secondary group of sarcoma. Giant cells commonly met in sarcomas were prominent in nine cases of this series, and were noted even in myoma malignum.

The mixed tumors of the uterus though rare deserve special mention. They are regional bidermal teratomas, in which malignant or blastomatous changes predominate and reproduce sarcoma, carcinoma and adenosarcoma. Their relation to the true teratomas is best shown in the case reported by Ribbert in which neurogenic derivatives were also found. According to Wilms they arise from embryonal rests scattered along the wolffian ducts and contain glandular and supporting mesodermal elements. The cervix is the seat of election. The body form is extremely rare and W. Shaw notes only 14 recorded cases in the literature until 1929. Mixed sarcomas of the body are generally submucous; pedunculated or sessile in type. Size is extremely varied. Histologically they are largely comprised of malignant embryonal mesodermal cells so that round and spindle cell sarcoma predominates. Differentiation results in the appearance of fibrous tissue, smooth and striated muscle, mucoid, osteoid and cartilage. Gland elements are intermingled. They are huge in size, lined by a tall ciliated columnar cell typically endometrial. Mucous secreting glands may be encountered. Two cases of mixed sarcoma of the body of the uterus (16501 and 18785) are included in this series, both submucous in position filling and dilating the endometrial cavity. Grossly the high myxomatous content was particularly striking. Histologically fibromyxosarcoma comprised the bulk of the tumors but hyalinized cartilage and smooth muscle and osteoid were differentiated. Endometrial glands of huge size were noted as also smaller mucous secreting glands of the cervical order as noted in the second case.

*Clinical Aspects.*—Sarcomas of the uterus are met at every age but occur most frequently after menopause, most prominently in the fifth to sixth decade. In this series two cases were encountered between the ages of twenty to thirty, two cases between the ages of thirty to forty, three cases between the ages of forty to fifty, six cases between the ages of fifty to sixty. Predominant clinical symptoms were as follows: (1) Vaginal bleeding was noted in 11 of 13 cases; its severity was varied but flow was always persistent, (2) palpable abdominal tumor was noted by 4 patients and recorded as rapidly growing by one, (3) abdominal pain of moderate severity was noted in four instances, most marked in one patient with sigmoidal involvement. Physical examination as a rule presented an enlarged, symmetrical uterus in the primary group. In the secondary sarcomas the uterus was generally irregular due to the concomitant benign fibromyomas. The cervical sarcoma presented as a polyp projecting from the external os. The true condition was seldom suspected for 11 of 12 cases of body sarcoma were diagnosed as benign fibromyoma. The cervical growth was considered a carcinomatous polyp. Since fibromyomas rarely produce symptoms after the menopause, the advent of bleeding at this age should suggest malignancy. Carcinoma of the body can be readily excluded by curettage, a procedure of decided value in establishing the diagnosis of uterine sarcoma. As emphasized by O. Frankl in his series, 14 of 15 primary uterine sarcomas and 7 of 22 secondary sarcomas encroached upon the endometrial cavity. In our series 5 of 8 de-novo and 2 of 5 secondary sarcomas reached the endometrium affording material for diagnostic curettage and histologic examination in over  $\frac{1}{2}$  of the cases. If tissue is not obtained by this procedure, immediate gross examination of operative specimens is in order if patients are subjected to hysterectomy for fibromyomas at or after menopause.

*Treatment.*—To be successful depends upon early diagnosis. This possibility may be afforded by curettage as just emphasized. With the correct diagnosis established and the growth limited to the uterus, complete extirpation of uterus, adnexa and parametrium followed by intensive deep x-ray should be the therapeutic rule. With infection of the tumor or severe anemia, this procedure has an initial primary mortality. In this event local excision of the tumor if accessible followed by radiation has been suggested by Halbrecht. Cases with broad ligament extension or established metastases to contiguous or distant viscera warrant only palliative radiation. Since the diagnosis of uterine sarcoma, is as a rule first established after operation, only supracervical hysterectomy and bilateral salpingo-oophorectomy has been performed. With myoma malignum or early secondary sarcomas well encapsulated in the preexisting fibroid, retention of the cervical stump is not of grave moment. Application of radium into the cervi-

cal canal followed by deep x-ray offers fair chances for recovery. In the advanced cases combination of surgery and radiotherapy is of doubtful accomplishment. Schreiner reporting 8 advanced cases treated in this manner, finds only one patient symptom-free about five years following operation. In this series of 13 sarcomas 7 patients were treated by supracervical hysterectomy and bilateral salpingectomy and one by supracervical hysterectomy and left salpingo-oophorectomy. Wide excision of the parametrium was not practiced for the diagnosis was not suspected. There were no immediate operative deaths in this group. Two patients, however, died within six months after operation from local recurrence; one nine months after operation from peritoneal metastasis and intestinal obstruction in spite of adequate deep x-ray therapy. Of the five living patients treated by supracervical hysterectomy (of which only one was treated by x-ray) all are symptom-free for intervals varying from six to fourteen months following operation. But it must be emphasized that in this group are included two cases of myoma malignum (17058 and 17622) and two cases of well encapsulated sarcomas arising in fibroid (15019 and 18232). Four patients were treated by panhysterectomy with one postoperative death, the result of peritonitis (18785). A second patient (11912) died six weeks after operation from angina pectoris. Of the surviving two; one is alive and well two years after operation and one symptom-free six months after operation although no radiation was employed in either instance (13659 and 17991). The cervical case treated palliatively by radiation because of broad ligament involvement is alive ten months after radium insertion. Recurrent bleeding and advancing infiltration has necessitated the administration of a second dose. The therapeutic possibilities of radiation alone in uterine sarcoma must be mentioned. Seitz and Wintz report 18 cases of which 11.1 per cent are cured after five years and 55 per cent symptom-free one to three years after treatment. The results were even better in the secondary sarcomas.

The prognosis of uterine sarcoma is always grave. It is dependent upon the duration of clinical symptoms, the site of tumor and the growth potential of its component cells. The first two factors are correlated. Primary sarcomas are more frequently submucous; bleeding therefore appears relatively earlier and medical intervention is more prompt. (Bleeding was recorded in 14 or 15 cases of primary sarcomas by O. Frankl.) In the group arising secondarily in fibroids bleeding may be entirely lacking or appear late because of the interstitial seat commonly held by fibroids. Encapsulation, however, delays local spread of the growth. The growth potential of the tumor may be gaged by the cell morphology. In primary sarcoma the purely spindle cell type designated as myoma malignum is slowly growing circumscribed and relatively benign for it can be entirely extirpated by



complete hysterectomy. Ewing in an experience of twenty years found only 3 cases of systemic metastases and only 2 with local recurrences. Of 4 patients with such morphology in this series 2 are symptom-free. The less differentiated spindle cell types hold an intermediary position as to malignancy. They invade uterine wall, parametrium and endometrium. In case (26191) of this type recurrence in the cervical stump was prompt and at autopsy performed four months later, peritoneal, omental and visceral deposits are noted. Embryonal, small spindle, and round cell sarcomas are most rapidly growing and destructive from the first and cause early systemic metastases. In sarcomas arising secondarily in preexisting fibroids prognosis varies with the extent of the growth and the cell type. Centrally placed tumors well capsulated may be completely extirpated by surgical means. The histology of the cell as in primary sarcomas determine the relative rate of growth. In both groups extension ultimately follows especially into the broad ligaments, retroperitoneal tissues and lymph nodes. Ovaries and tubes are involved by continuity and implantation. Sarcomatous thrombi in vessels account for pulmonary, hepatic and bony metastases. Local recurrence is the general rule in advanced cases in spite of complete hysterectomy or radiation.

#### CONCLUSIONS

1. Mural sarcoma of the uterus comprises a primary or de-novo group and a secondary form occurring in preexisting fibromyomas. Both are of myogenic origin and arise from orthotopic embryonal rests in the uterine wall or within the confines of a preceding fibromyoma. The mixed sarcoma of the uterus is a primary sarcoma of the teratoid type.
2. The degree of maturation of the component cell determines gross appearance, rate of growth and clinical malignancy of these tumors. (a) Tumors comprised of differentiated muscle cells (myoma malignum) clinically and grossly pose as fibromyomas. They are slow growing, rarely recur or metastasize. (b) More actively growing forms appear as spindle, fusiform and round and giant cell sarcomas. Grossly they are homogeneous and opaque; infiltrate relatively early and metastasize by the blood stream. (c) Mixed sarcomas comprised of embryonal elements grow rapidly and recur promptly. Cell differentiation produces mucoid, smooth and striated muscle, osteoid and cartilage; glands are of local stamp.
3. The site of the tumor determines the clinical mode of onset. Primary sarcomas more frequently submucous produce bleeding relatively earlier and more constantly than in the secondary group arising in interstitially placed myomas.
4. Both types are most prevalent after menopause, when fibroids as a rule are inactive.



5. Diagnostic curettage will yield material for pathologic diagnosis in 50 per cent of primary and secondary sarcoma. Uteri removed for supposed fibroids after menopause require immediate gross pathologic examination to exclude sarcoma.

6. Radical extirpation followed by postoperative radiation is indicated in growths still confined to the uterus. Palliation by radiotherapy should be the rule for advanced cases.

7. Prognosis though generally grave is surprisingly good in myoma malignum. Sarcomas arising in fibroids offer fair prognosis, if of small size and confined within the capsular limits of the original growth.

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#### RESUME OF CASES

##### PRIMARY SARCOMA

CASE 1.—(13304) Mrs. C. C., aged thirty-three; nullipara, admitted March 10, 1924, complaining of vaginal discharge and prolonged menses. Six months prior to admission menses previously of four days' duration increased to seven days. For the past five weeks, bleeding has been persistent. Uterus found enlarged to the size of a four months' gestation. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed for suspected fibromyoma. Postoperative course uneventful, no radiation. Patient reported dead four months after operation. Pathologic Report: Uterus: was globoid, symmetrically enlarged and measured  $15 \times 10 \times 8$  mm. The solitary tumor found in the posterior wall measures 8 cm. in diameter; its growth direction was centripital with encroachment upon the cavity. On section the tumor was opaque, soft, grey-white; border was irregular. No capsule was evident. Areas of necrosis, thrombosis and cystic changes were common. Microscopically: Sections from the periphery of the tumor failed to reveal evidence of preexisting fibromyoma or capsule. Tumor was comprised of fusiform and spindle cells arranged in parallel intersecting columns or whorls. Cytoplasm was moderately granular, myoglia were reproduced. Nuclei were irregularly oval, varying in size, shape and staining capacity and were centrally placed. In the central portion of the tumor differentiation was less marked; cells were spindle, no myoglia were reproduced. Nuclear irregularity was more prominent; giant cells were numerous. Huge capillary sinusoids were numerous. Tubes and ovaries showed no abnormalities. Diagnosis: Primary mural sarcoma.

CASE 2.—(13655) Mrs. A. F., aged forty-six, was admitted Oct. 8, 1926, complaining of vaginal bleeding for the past six months. Examination revealed the uterus enlarged to the size of a six weeks' pregnancy. Diagnosis: Fibromyoma. Complete hysterectomy, bilateral salpingo-oophorectomy Oct. 10, 1926. Postoperative course uneventful. No radiation. Well when last seen November, 1928.

Pathologic Report: Uterus was typically pyriform and measured  $7 \times 5 \times 3$  cm. Cervix was normal. Posterior body wall presents an interstitial ovoid tumor measuring  $2\frac{1}{2}$  cm. wide, centrally placed at the level of the uteroovarian ligaments. On section the tumor was not encapsulated, grey, opaque; focally hemorrhage was present. Metastatic nodules 1 to 3 mm. in diameter were encountered in the adjacent myometrium reaching practically to the serous coat. Microscopically: Sections from the uterus and tumor-free zone were essentially negative. Tumor and the focal metastasis presented a similar structure. Constituent cells were small, spindle, fusiform and of the large round cell type. Cytoplasm was scant. No myoglia were reproduced. Nuclei were spindle, ovoid or round and vary strikingly in size, shape,



Fig. 1.—Primary sarcoma of the uterus, submucous type. Note the opaque grey homogeneous structure in the center. Thrombosis is marked. There is no evidence of a capsule. (Specimen Case 1.)

and staining capacity. Mitotic figures were numerous. The vessels were numerous, thrombosis was marked due to plugs of tumor cells. No capsule or remnants of fibromyoma were encountered. Tubes and ovaries were free from changes. Diagnosis: Primary mural sarcoma, interstitial, spindle and round cell type.

CASE 3.—(16364) Mrs. A. A., aged fifty-six, admitted March 11, 1928, complaining of vaginal bleeding of two months' duration. Menstrual 14—28—4, menopause at the age of forty-four. Gravida i, para i. Physical examination: Cervix thickened to twice its normal size and fixed; os patulous and presented a hemorrhagic polyp  $2 \times 1$  cm. Body of uterus anterior, small. Both parametria were infiltrated. Diagnosis: Polypoidal carcinoma of cervix. Parametrial extension. Operation March 13, 1928. Biopsy of cervix, insertion of radium (dose 3,300 mg. hr.). Leucorrheal discharge persisted since discharged from hospital in March, 1928. Moderate bleeding recurred October, 1929. A second dose of radium of

2,400 mg. hr. was given Nov. 30, 1929. Cervix was atrophic and flush with vaginal vault. Parametrial infiltration of both broad ligaments persisted. Pathologic Report: The several fragments submitted for study presented essentially similar changes. The surface was lined by necrotic and infected tissue. More deeply tumor elements were preserved, comprised of spindle and fusiform cells arranged in broad sheaths. Interlacing was demonstrated with moderate frequency. Cell borders were poorly defined, cytoplasm was abundant; fibrillae were differentiated. Nuclei were spindle and fusiform in type, varying decidedly in size, shape, and staining capacity. Giant cell forms were encountered. In several areas small spindle cell sarcoma was reproduced. Blood vessels were numerous. No fibro-

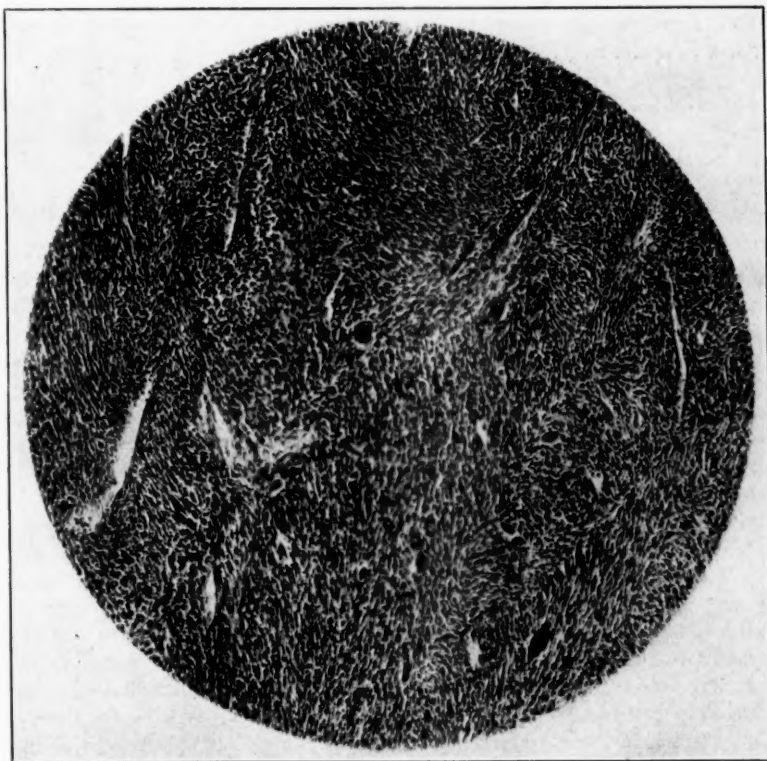


Fig. 2.— $\times 80$ . Primary myosarcoma. Note the interlacing sheaths of large, spindle cells resembling involuntary muscle. Cell borders are well defined, cytoplasm is granular and nuclei centrally placed. Mitosis is frequent. The numerous giant cells are prominent. (Section from Case 1.)

myomatous or cervical glandular elements were noted. Diagnosis: Primary cervical myosarcoma, bilateral, parametrial infiltration.

CASE 4.—(17058) Mrs. H. B., aged fifty, admitted Sept. 18, 1928, complaining of vaginal discharge and enlargement of abdomen for the past year. Menstruation is regular. Abdomen is enlarged presenting tumor the size of a six months' pregnancy arising from pelvis. Clinical diagnosis: Fibromyoma. Operation Sept. 20, 1928. Supracervical hysterectomy, bilateral salpingo-oophorectomy. Postoperative course uneventful, no postoperative radiation. Reported symptom-free by family physician to date. Pathologic report: Uterus removed by supracervical hysterectomy, pyriform and measures  $17 \times 17 \times 7\frac{1}{2}$  cm. The organ was the seat

of multiple fibroids, the largest one 10 cm. interstitial in type, was located in the right anterior and lateral walls. A second tumor filled the left half of the organ and measured 13 cm. in diameter. It encroached upon the cavity which it displaced obliquely and to the right. Endometrium was atrophic over this fibroid; the serosa was edematous. Pedunculated subperitoneal myomas varying from 2 to 4 cm. were located on the posterior wall. On section the large tumor in the left wall was grossly edematous; the usual shimmer was lacking. The border was circumscribed, capsule was not sharply defined. The remaining tumors showed the usual silky hue and whorled appearance of fibroids and presented atypical capsule. Microscopically: The endometrium corresponded to the postmenstrual phase. The myometrium was normal except for congestion. The fibroids presented the usual structure, consisting of muscle and connective tissue cells. The large tumor above noted was comprised of huge, spindle cells coursing in parallel sheaths intersecting at right angles or arranged in concentric whorls. The cell cytoplasm was abundant, fibrillar. The nuclei were large, ovoid or cigar shaped and centrally placed. Giant cells were not uncommon and served for the differentiation from benign cellular myoma. Capillary sinusoids were abundant. Areas of edema and liquefaction necrosis were numerous. Remnants of preexisting fibromyoma were not demonstrated. Capsule was lacking. Tubes and ovaries presented no pathology. Diagnosis: Primary mural sarcoma, myoma malignum.

CASE 5.—(17401) Mrs. I. B., aged fifty-nine, admitted Dec. 5, 1928, complaining of vaginal bleeding and pain in the left lower quadrant. Married forty years, gravida 9, para 9, menopause at the age of forty-five. Cervix was found atrophic. Uterus enlarged to the size of a two months' pregnancy; soft, indefinite fullness present in left lateral fornix. Supracervical hysterectomy, bilateral salpingo-oophorectomy performed. Sigmoid covered with adhesions. Postoperative course uneventful. Four deep abdominal x-ray treatments. Examination Oct. 7, 1929. No symptoms, no evidence of local or general metastases. Pathologic Report: Uterus removed by supracervical hysterectomy globoid measuring  $7 \times 15 \times 6$  cm. The posterior fundal wall was covered with firm adhesions. Uterine cavity was dilated and filled with a lobular, pedunculated tumor measuring  $7 \times 7 \times 5$  cm. Its consistency was soft. On section the color varied from red to blue-black, the result of interstitial hemorrhage. The outer third was necrotic; central area presented a homogeneous opaque grey-white appearance. No evidence of capsule was grossly demonstrable. Microscopically: Over the central portion of the tumor, endometrium was still preserved. The stroma, however, was replaced by tumor elements as encountered in the tumor proper. The constituent cells were large, spindle, arranged in broad interlacing fasciuli. The cell cytoplasm was abundant; borders well defined. Fibrillae were reproduced. Nuclei were large, oval or spindle in form and generally centrally placed. Hyperchromatism was prominent, mitosis frequent. Giant cells were frequent and presented single or lobulated nuclei. Capillary sinusoids were numerous; thrombosis is frequent. No signs of capsule were present. Tubes and ovaries were free from changes. Diagnosis: Primary mural sarcoma, submucous.

CASE 6.—(17622) Mrs. C. H., aged thirty-seven, admitted Feb. 9, 1929, complaining of profuse menstruation, swelling in lower abdomen and dysmenorrhea for the past year. Married three years, gravida 2; para 2. Last menstrual period Jan. 18, 1929. Uterus is enlarged by multinodular tumors. Preoperative diagnosis: Multiple fibroids. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed, Feb. 13, 1929. Postoperative course uneventful. No x-ray or radium employed. Last examination September, 1929. General condition good. No complaints, no local or systemic metastases. Pathologic Report: Uterus was en-



larged and irregular, it measured  $11 \times 11 \times 10$  cm. and presented numerous small sessile fibroids distributed throughout the posterior, body and fundal walls. A large interstitial myoma 8 cm. in diameter was placed in the right anterolateral wall but did not encroach upon the cavity, though the latter was somewhat irregular. The endometrium presented no abnormalities. Myometrium was normal. On section the large tumor growing toward the cavity was soft in consistency; fasciuli present were poorly defined. Areas of liquefaction necrosis were frequent. No capsule was grossly demonstrable. Other tumors presented the usual silky hue and whorled appearances of benign fibromyoma. Microscopically: The endometrium was of the premenstrual type. Myometrium was normal in the tumor-free zone. Section from the large tumor presented the picture of cellular myoma through many areas. Component cells were large, spindle and arranged in broad interlacing or crescentic sheaths. Cytoplasm was abundant, nuclei though hyperchromatic were cigar shaped and regular. Infrequently atypical giant cell forms were encountered with a large solid staining or multilobular vesicular nucleus. Here the component spindle cells assumed a fusiform or irregularly ovoid type. At the junction with the myometrium no sinuses or capsular elements were demonstrated. Tubes and ovaries presented no pathology. Diagnosis: Primary mural sarcoma, myoma malignum.

#### MIXED SARCOMA

CASE 7.—(16501) Mrs. M. D., aged fifty-five, admitted Aug. 20, 1928, complaining of abdominal tumor and foul discharge noted for eight months before admission. Married thirty-seven years, gravida i, para i. Uterus found symmetrically enlarged to the level of the umbilicus. Clinical diagnosis: Fibromyoma. Operation: Supracervical hysterectomy, bilateral salpingo-oophorectomy. One deep x-ray treatment following operation. Prompt local recurrence with diffuse peritoneal metastases. Patient died May, 1929, nine months following operation. Pathologic Report: Uterus was irregularly enlarged and measured  $14 \times 8$  cm. It was the seat of multiple interstitial fibroids. On incision the cavity was filled with a sessile lobulated tumor reaching from fundus to level of transection. Tumor was dull, grey-white, opaque and extended into the myometrium for 5-40 mm. Focally, necrosis and areas of myxoma were encountered. The remaining fibroids presented the usual silky hue and whorled appearance. Microscopically: the tumor was largely comprised of fibromyxosarcoma. Islands of osteoid, smooth muscle and hyaline cartilage were present. Endometrial glands of embryonal nature were present. Epidermoid metaplasia was not uncommon. Tubes and ovaries presented no pathology. Diagnosis: Mixed sarcoma of the uterus.

CASE 8.—(18785) Mrs. A. V., aged forty-six, admitted Sept. 19, 1929, complaining of vaginal bleeding and backache. Married seventeen years, gravida 17, para 14. Menstrual 12—28—6. In January, 1927, a dose of 1,500 mg. hr. of radium was administered for endometrial hyperplasia (confirmed by slide). Amenorrhea persisted for one and a half years thereafter. Bleeding recurred July, 1929, and persisted until admission. Several, large, necrotic tissue fragments were expelled during August and September. Curettage Sept. 21, 1929, revealed fibromyxosarcoma. Operation Nov. 26, 1929. Complete hysterectomy, bilateral salpingo-oophorectomy. Patient died three days after operation from postoperative peritonitis. Pathologic Report: Uterus was globoid, and measured  $13 \times 11 \times 8$  cm. Omental adhesions presented in the region of the fundus. Uterine cavity contained a globoid tumor lying in the posterior wall reaching from fundus to portio measuring  $10 \times 5$  cm. Overlying endometrium was necrotic; encapsulation was lacking. Medial half of the tumor was blue-black in color, result of interstitial hemorrhage. The basal half presented frequent areas of myxomatous tissue. The remainder of the the



uterus presented no gross pathology. Microscopically: The bulk of the tumor was comprised of embryonal mesodermal elements and fibromyxosarcoma largely predominated. Focally clusters of smooth muscle were differentiated. Islands of well-matured hyaline cartilage were present. Glands of the cervical and endometrial type were encountered. Tubes and ovaries presented acute and subacute salpingo-oophoritis. Diagnosis: Mixed sarcoma of the body, acute and subacute salpingo-oophoritis.

#### FIBROIDS ARISING IN SARCOMA

CASE 9.—(11192) Mrs. C. N., aged fifty-two, admitted Nov. 16, 1924, complaining of pain in the lower abdomen and vaginal bleeding. Menopause occurred at the age of forty-seven. Symptoms began two weeks prior to admission to the hospital. Uterus found enlarged, reaching 8 cm. above the symphysis. Complete hysterectomy and bilateral salpingo-oophorectomy performed Nov. 24, 1924, culdesac, and sigmoid evidently involved. Postoperative course uneventful. No postoperative radiation. Patient died Dec. 24, 1924, one week after discharge from the hospital, evidently of coronary thrombosis. Pathologic report: Uterus symmetrically enlarged, ovoid in form measuring  $14 \times 10 \times 8$  cm. Uterine cavity was dilated, filled with a pear-shaped submucous tumor 10 cm. in diameter, arising by a wide pedicle from the central fundal zone. Tumor also extended through the uterine wall reaching the serous coat. On section the right half of the tumor presented the whorls and silky hue of fibroid. In this segment a well-defined capsule was retained. The left half was soft, necrotic and edematous. Islands of myxoma were grossly recognizable. Microscopically: the tumor was comprised of whorls of large spindle cells concentrically arranged. The cell border was sharply defined. Cell cytoplasm was abundant and granular. The nuclei were short, wide and moderately hyperchromatic. Mitotic figures were numerous. In the myxomatous zones grossly noted extensive edema had caused fraying of the cells. The cytoplasm was lacking or precipitated in irregular granules. The nuclei of these cells were pale, round or oval. True spider cells were not encountered. Thrombosis and necrosis were widespread. Tubes and ovaries presented no pathology. Diagnosis: Sarcoma arising in fibroid, submucous.

CASE 10.—(15019) Mrs. A. H., aged forty-seven, admitted March 27, 1928, complaining of abdominal pain and menorrhagia for the past three months. Married twenty-one years, gravida 2, para 2. Last menstrual period March 12, 1928. Uterus was irregularly enlarged by multiple fibroids and reached the level of the umbilicus. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed March 3, 1928, for supposed fibroids. Postoperative course uneventful, no postoperative radiation. Nov. 3, 1928, seven months after operation, the general condition was good; cervical stump high, no local recurrence. Pathologic Report: Uterus was enlarged and distorted by multiple fibroids and measured  $18 \times 14 \times 6$  cm. Multiple interstitial fibroids varying from 11 to 4 cm. were distributed through all walls. A submucous myoma 7 cm. in diameter dilated the cavity. The largest tumor measured 11 cm. in diameter and lay in the anterior wall of the organ. On section it presented several mucoid areas varying from 2 to 4 cm. in size which were dull and homogeneous. The remainder of the tumor was glossy and presented prominent whorls. Capsule was well differentiated. Remaining tumors present the usual silky hue and whorled appearance. On section the opaque areas in the large tumor were comprised of large spindle cells coursing in broad parallel columns. Interlacing, however, was not marked. Cell cytoplasm was abundant and granular. The nucleus was centrally placed. The latter presented extreme variation in size, shape and staining affinity. Giant types were not uncommon. Zones of small spindle and fusiform sarcoma were also encountered.

The benign fibromuscular elements of the preexisting fibroid were well shown at the peripheral portion of the tumor. Tubes and ovaries presented no pathology. Diagnosis: Sarcoma arising in fibroid.

CASE 11.—(17991) Mrs. M. O., aged fifty-three, admitted Feb. 26, 1928, complaining of vaginal bleeding and pain in the lower abdomen. Menopause occurred at the age of forty-three. Symptoms present for eleven months. Abdominal examination revealed a tumor extending from the pelvis reaching 8 cm. above the pubis. Cervix is small and atrophic. Clinical diagnosis: Sarcoma of the uterus. Complete hysterectomy and bilateral salpingo-oophorectomy performed March 2, 1929. Postoperative course was uneventful. No postoperative radiation. Last exam-

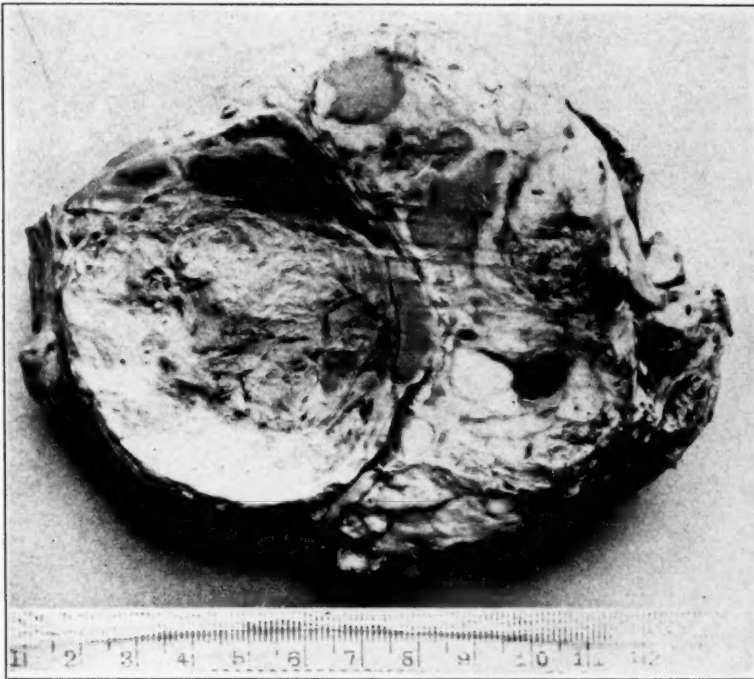


Fig 3.—Sarcoma arising in fibroid. The interstitial tumor preserves its capsule. A crescentic zone at the periphery is opaque and homogeneous. Dark coloration is result of interstitial hemorrhage. Extension into the myometrium is marked. Contrast the whorled appearance of the benign fibromyomatous elements with the homogeneous appearance of the sarcoma areas. (Case 11.)

ination Oct. 18, 1929 (seven months after operation) revealed general condition good, no evidence of local recurrence. Pathologic report: Uterus was globoid and measured  $15 \times 13 \times 11$  cm. Cervix presented senile atrophy. A small interstitial myoma 2 cm. in diameter presented in the anterior fundal wall. A second tumor 8 cm. in diameter presented posteriorly occupying fundus and body. The endometrial cavity was elongated and compressed due to centripital growth of the tumor. The overlying endometrium was necrotic. On section the tumor was sharply circumscribed, the capsule well retained. For descriptive purposes, it was divided into two zones; an upper segment measuring  $7 \times 2$  cm., was largely necrotic but presented islands of preserved grey-yellow brain-like tissue. The remainder presented the usual hue and whorled appearance of fibromyoma. In this segment the capsule was well retained. Invasion of the tumor into the contiguous myo-

metrium had occurred, and gray opaque islands of tumor tissue were everywhere in evidence. Microscopically: The tumor was comprised of spindle and fusiform cells arranged in indistinct but recognizable sheaths which intertwine. Cell cytoplasm was scant. No myoglia were reproduced. Nuclei varied from oval to fusiform to spindle in shape. Hyperchromatism was marked; mitotic figures were frequent. Giant cells with solid nuclei were encountered. In the fibroid segment, typical arrangement of constituent benign muscle and connective tissue was noted. The capsule was well preserved. Tubes and ovaries presented no changes. Diagnosis: Sarcoma arising in fibroid.

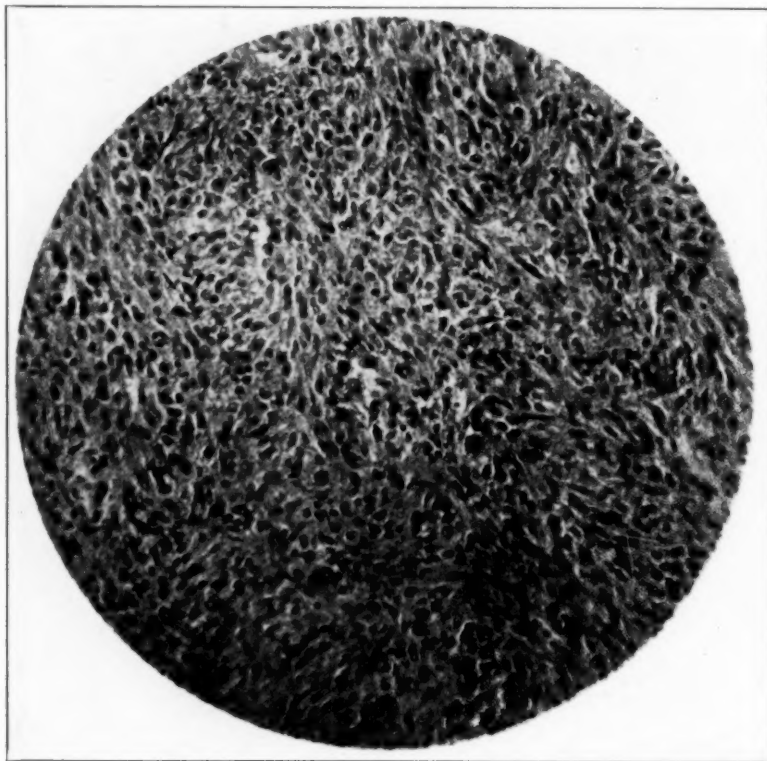


Fig. 4.— $\times 120$ . This sarcoma is comprised of spindle and fusiform cells. Sheaths are poorly defined but recognizable. Cell cytoplasm is scant; nuclei are oval, round or spindle in form. Hyperchromatism is marked, mitosis numerous. Large giant nuclei are also encountered. (Case 11.)

CASE 12.—(26-19-1) Mrs. A. E., nullipara, aged twenty-five, admitted Dec. 5, 1923, complaining of abdominal mass noted as rapidly growing for three months before admission. Myomectomy performed at the age of seventeen for excessive bleeding. Menstruation normal following operation. Abdomen presented large soft tumor, relatively symmetrical reaching level of the umbilicus. Supracervical hysterectomy and bilateral salpingo-oophorectomy for supposed fibroid performed Dec. 8, 1923. Postoperative course uneventful. Three postoperative deep abdominal x-ray treatments. Readmitted April, 1925, with symptoms of intestinal obstruction. Peritoneal cavity filled with tumor metastasis. Death occurred May 14. Autopsy revealed omental and peritoneal metastasis. Retroperitoneal deposits 14 cm. in diameter encountered at the root of the mesentery. Pathologic Report: Uterus was sym-

metrical, globular and enlarged to the size of a four months' gestation by a solitary tumor in the posterior wall measuring 18 cm. in diameter. On section a well-preserved capsule was noted at the periphery. More prominent in the inferior half were irregular opaque islands of grey-yellow tissue varying from 1 to 4 cm. in diameter. Extension into the contiguous muscle had occurred. Microscopically: The tumor presented sheaths of interlacing spindle cells. Cytoplasm was moderate. Focally fibrillae were produced. Nuclei were oat shaped, round or oval. Hyperchromatism was marked. Large solid nuclei were common. Giant cells were encountered. Capillaries were sinusoidal in type. Tubes and ovaries were free from changes. Section of metastases obtained at autopsy revealed wide ovoid and fusiform cells arranged in broad columns. The cell outline was well defined; cytoplasm was vacuolated and abundant. Huge nuclei, round, oval or biscuit shaped were present. Giant forms were numerous. Some of the nuclear changes were evidently the result of radiation. Capillaries were sinusoidal and numerous. Diagnosis: Sarcoma arising in fibroid, local recurrences, peritoneal metastasis.

CASE 13.—(18232) Mrs. M. M., aged twenty-six, admitted June 27, 1929, complaining of abdominal mass and irregular vaginal bleeding for eight months. Married ten years, widow two years; one pregnancy, terminated in abortion. Examination showed uterus enlarged, extending from pelvis to the right iliac fossa reaching 8 cm. above Poupart's ligament. Clinical diagnosis, fibromyoma. Operation June 29, 1929. Supracervical hysterectomy and right salpingo-oophorectomy. Postoperative course uneventful; no postoperative radiation. Examination December, 1929, six months after operation showed no evidence of local recurrence; general condition good. Pathologic report: Uterus heart-shaped, regular, measuring  $10 \times 12 \times 10$  cm. All walls held interstitial fibromyomas varying from 3 to 6 cm. in diameter. A pedunculated myoma in the posterior wall measured 6 cm., was well circumscribed but on section was dull with sparse fasciuli. The remaining fibroids presented the usual luster and whorled appearance. Endometrial cavity and uterine musculature were free from changes. Microscopically: The endometrium presented changes of the interval phase. The myometrium was dissected by sinusoids. Section from the central tumor presented the following: The bulk of the tumor was comprised of fusiform and spindle cells coursing in broad parallel sheaths. The cell boundary was fairly well shown. Cytoplasm was moderate and granular. Nuclei were generally short, oval with blunted ends. Hyperchromatism was marked. Variation in size and shape was not uncommon. Solid giant forms were occasionally noted. In several segments large, round cell forms were present. Sheaths of benign muscle and connective tissue cells were irregularly distributed. A capsule was sharply demarcated at the periphery but clusters of tumor cells had extended into the vessels which were of sinusoidal type. Right tube and ovary presented no pathologic changes. Diagnosis: Sarcoma arising in fibroid, interstitial.

1530 PRESIDENT STREET.

THE ELECTIVE CESAREAN SECTION AS A PROPHYLACTIC  
MEASURE AGAINST OBSTETRIC MORTALITY  
AND MORBIDITY\*

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AMONG surgical procedures, cesarean section has been subjected most frequently to condemnation for its indiscriminate performance. Even a strong protagonist of this operation must admit that many of the attacks have been justified and that a regrettable number of deaths must properly be attributed to its performance under improper conditions and by faulty methods. However, in justice to the accused procedure, one should consider how much the principle of cesarean section is at fault and how much of the misfortunes following its use must be credited or better, debited, to the operator. It is astonishing with what self-confidence a physician entirely untrained in abdominal surgery will attempt a cesarean section, very often under conditions which would make its most ardent advocate hesitate.

As the result of a deep interest and rather close study for the past thirty years, I have reached the deliberate conclusion that elective cesarean section, performed by a trained obstetric specialist, carries with it no mortality other than that intangible risk which is attendant upon any intraperitoneal operation. Under such conditions the mortality of abdominal hysterotomy compares very favorably with interval appendectomy as the safest of all abdominal procedures. There is but one danger, and that is the possible rupture of the cesarean scar during subsequent pregnancies, but like the possibility of carcinoma developing in the cervical stump after supravaginal hysterectomy, this complication is far outweighed by the advantages of the operation in minimizing the dangers of childbirth in certain groups of cases.

I have previously called attention to the fact, that as a result of the continued criticism of cesarean section in the profession, there has arisen the curious condition that clinics wherein this procedure is practiced in a minimum of cases proudly advertise the fact, whereas those institutions in which the operation is frequently practiced, hang their heads and avoid all comparison of statistics. Tests of labor lasting for ninety-six hours, difficult forceps operation and version, are common in the analysis of case reports from the first type of clinic, and this naturally brings us to a second conclusion, namely, that in

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dystocia of any variety except soft tissue obstruction at the vulvar outlet, elective cesarean section under local anesthesia, will result in a marked lowering of mortality and morbidity in both mother and child.

This communication proposes to consider only truly elective cesarean sections, dealing with those cases in which there is a distinct choice between abdominal and vaginal delivery, and will not touch upon the section of necessity in absolutely contracted pelvis, nor upon neglected cases when long-continued impaction or impending uterine rupture renders vaginal delivery impossible.

The cases in which purely elective section should at least be considered may be grouped as follows:

1. Borderline cases, primiparae with moderate degrees of pelvic contraction, instances of fetal disproportion from large babies, and those neurotic women of constitutional inferiority who have some diminution in the capacity of the pelvic cavity.

2. Elderly primiparae, especially where there is some small degree of pelvic contraction.

3. Central placenta previa with viable child.

4. Certain types of eclampsia.

5. Cases complicated by debilitating systemic disease, severe cardiac lesions, exophthalmic goiter, advanced tuberculosis, and so on.

It is to the first group that I beg to call attention particularly.

Careful prenatal study will segregate, from any series of pregnant women, a varying number who present definite evidences of pelvic deformity, various degrees of contraction, excessively long and beaked symphyses, heavy masculine osseous development and the like. It is a prime object of scientific obstetrics to predetermine that method of delivery in such cases as will insure a minimum mortality rate for both mother and infant as well as the greatest possible freedom from remote morbidity and continued ill-health. There are several methods of approaching this problem.

*The first*, that of hoping for successful vaginal delivery with abdominal hysterotomy as a last resort, needs no further discussion, as no trained obstetrician would consider such procedure.

*The second*, is to employ the well-known but variously defined test of labor, including from six to twelve hours of active uterine contraction, which is the rule in some clinics, or the method of Tweedy, which holds that so long as the maternal temperature and pulse rate do not exceed 100° F. or 100 beats per minute, respectively, and the fetal heart sounds do not decrease below 100, neither mother nor infant is in danger. This test of labor proving ineffective, resort is made to cesarean section.

*The third* plan is for the obstetrician to determine before the onset of labor whether abdominal or vaginal delivery offers the greatest

hope for an optimum result for both patients and to proceed upon that decision. This plan embraces the group of purely elective cesarean sections and is the one to which the writer is committed.

The so-called test of labor has much to commend it and bears the stamp of approval of many of the best obstetric minds of this country and Europe. It possesses, however, certain inherent faults which, in my belief, render it of little value except in a small, carefully chosen group of cases.

In the first place, no one has made a satisfactory definition of a test of labor, since the utilization either of the time factor or the severity of the uterine contractions to establish a standard, is impossible, both elements being so variable in different women. The Tweedy method of estimating the safety of mother and child by a reference to pulse rate and temperature alone, is extremely repugnant to me, as under its use strong women spend hours of useless agony before being tendered that aid which was their due. Furthermore, all too often, while one is observing a test of labor, the golden moment of election for operative interference is lost; the membranes rupture, the woman becomes suddenly exhausted, is no longer a justifiable risk for cesarean section and labor must be terminated by some form of operative vaginal delivery with more or less disastrous consequences to mother and child.

The third method of conducting labor in the presence of dystocia, that is, the predetermination of the mode of delivery and the abiding by the choice so made, if at all possible, puts the responsibility for the obstetric diagnosis and the probable outcome of the labor squarely upon the obstetrician, where it belongs. Thus we reach our third conclusion, namely, that an obstetrician, if he be competent, should be able to determine before labor but at term, in the great majority of instances, whether a woman will deliver herself spontaneously or by the aid of low forceps, or whether abdominal hysterotomy will be necessary to obviate obstruction and delay, with possible damaging high or high-mid forceps application to secure delivery.

Careful pelvic measurements made early in pregnancy and confirmed during the last month, offer a starting point in the determination as to the best method of delivery. Measurement of the fetal head by Perret's method, the fitting of head to pelvis in the last two weeks of pregnancy and finger exploration of the pelvic cavity with special reference to the length and direction of the ischial spines and the height and thickness of the symphysis, all serve to give a definite conception of the possibility of spontaneous delivery. To this should be added observation of the father, as to his general physique and especially the size and formation of his head, with an obstetric history of the patient's mother. These facts having been determined, the obstetrician should then and there decide whether reasonably easy and

safe vaginal delivery may be anticipated and if this seems not probable, he should plan and perform elective cesarean section, under local anesthesia at term, but before the onset of labor if possible.

Experience has taught me to reach a fourth conclusion, namely, that when painstaking and thoughtful examination of both the mother and her intrauterine infant has been carried out during the last months of pregnancy, the nature of the labor and the indication for its management can be correctly determined in the great majority of instances. The percentage of error will be in favor of both mother and child, since neither should suffer as the result of a perhaps unnecessary section, but one may die and the other be invalidated as the result of a vaginal delivery done under erroneous indications. And here arises the question of the secondary morbidity of difficult vaginal as opposed to abdominal deliveries. The writer is firmly convinced that the subsequent disability of the woman who has undergone a high or a high-mid forceps operation or a difficult version is very much greater than that after cesarean section. The sacro-iliac relaxation and the laceration and detachment of the deep fascial slings of the vagina, which lesions can never be adequately repaired, far exceed the dangers of peritoneal adhesions, which are perhaps the only sequelae of elective cesarean section productive of morbidity, as factors in producing long-continued ill health.

There remains to be considered the primary mortality of both mother and child as a result of the contrasting procedures which have been presented. Here again a strong personal belief must be stated, as my fifth conclusion, namely, that the primary mortality in cesarean section before rupture of the membranes, before the patient is unduly fatigued, and with adequate preoperative preparation, will be so low as to contrast favorably with any other method of delivery in similar cases, especially if the operation be performed under local infiltration with novocaine and without resort to inhalation anesthesia.

As concerns the baby, no argument need be advanced, since the high death rate of infants delivered by difficult vaginal extraction is a matter of common knowledge.

The second group, that of the elderly primipara especially those in whom there exists even minor degrees of pelvic contraction, is but a variation of the first group. Among these patients, however, there are a number in whom subsequent pregnancies are improbable, and consequently the life and health of the baby is the paramount consideration. The writer admits here a degree of radicalism which may properly be subject to criticism. Realizing the safety and ease of section, and remembering the long and stormy labors, the inertia uteri and the imperfect dilatation of the recalcitrant elderly cervix, abdominal delivery is chosen by me upon what may be somewhat flimsy indications, but patients so treated have usually at least an

uninjured baby and are themselves in good health from the obstetric standpoint, which is all that should be striven for in this somewhat restricted class of patients.

With regard to cases of placenta previa, the facts are somewhat different. In the presence of this lesion, section is indicated whenever vaginal delivery presents any difficulty, or when delay would be necessary to accomplish extraction by the vaginal route. Minor degrees of pelvic contraction in primiparae, noneffacement of the cervix, or a large child associated with central or nearly central placenta previa, are indications for celiohysterotomy. When the cervix is easily dilatable, the child of average size or smaller, and the placenta does not entirely occlude the os, vaginal delivery is probably the method of choice, although continued experience and study of mortality statistics would lead to the belief that section is indeed the most conservative method of dealing with placenta previa in most instances.

In group four, certain cases of eclampsia, I feel that elective section has a very distinct though sharply restricted field. It is my practice to always attempt treatment by conservative measures in eclampsia but to unhesitatingly perform section in those primiparae (and rarely multiparae) who show no evidence of beginning labor, who have long and uneffaced cervixes, and who grow definitely worse or at best show no improvement whatever after, say, twelve hours of conservative treatment. We have all seen patients who, coming to hospital in good general condition, rapidly fail under the most careful medical regimen, either the unmodified Strogonoff treatment or a combination of sedative and eliminative measures, which is my general plan for managing the cases. In such patients, the only hope seems to lie in a prompt termination of the pregnancy, with a minimum of trauma and since there is not time for an induced labor to be completed, section under local anesthesia seems to offer the greatest possibility for success.

It is to be clearly understood that, as stated before, section in eclampsia is suitable in only a sharply restricted group of patients, and that its general use in the treatment of this toxemia usually leads to disaster.

Severe cardiac disease, advanced tuberculosis, and other marked constitutional disturbances are being treated more and more by abdominal delivery, under local anesthesia, than by the vaginal route. The expenditure of energy on the part of the patient is so greatly reduced and the operation is so free from shock and trauma that a contrast between a woman undergoing labor, either spontaneously or by the aid of instrumental methods, with the frequent necessity for the employment of general anesthesia, is most striking and convincing.

With regard to the type of operation, I routinely employ the classical method, the incision made to the right of the umbilicus and extending one-fourth of its length above and three-fourths below this point.

The low cervical section as modified by Beck and so warmly advocated by DeLee and his followers is never used by me in the performance of elective cesarean section for several reasons. First, it is more difficult and requires more time, and it is one of my surgical convictions never to perform a complicated operation when a simple one will suffice. Second, the lack of distention and thinning of the lower uterine segment before labor, renders the extraction of the child far more difficult, and the danger of laceration of the ends of the uterine incision with sometimes obstinate hemorrhage, is an ever present one. Third, inasmuch as I do not regard peritonitis as a probable sequela of elective cesarean section, the additional protection afforded by the low operation is not needed, and last because, although it is a perfectly practicable procedure, the cervical section does not lend itself to local anesthesia with as much facility as does the simple, high incision. The preceding remarks should not be considered as a criticism of cervical section, which is an admirable procedure and a distinct contribution to the obstetric armamentarium, but I regard it as especially fitted for these cases in which labor has progressed for some time and when there is potential danger of infection.

#### TECHNIC OF OPERATION

To obtain the optimum results from the elective section under local anesthesia, close attention to a number of small details is absolutely necessary. The patient is admitted to the hospital twenty-four hours before the contemplated operation and is subjected to the usual laboratory tests and a careful physical investigation. A vaginal examination, with estimation of the relation between fetal and pelvic size determines the correctness or error of the previous findings. The diet is light, with an abundance of fluids. The colon is emptied by a soapsuds enema. Three hours before operation, sodium luminol is administered by mouth, the dose varying from 8 to 15 gr., depending upon the physique of the patient. At this time her relatives are excluded from the darkened room and the woman usually rapidly falls asleep. One hour before operation she is gently and quietly taken to the anesthesia or some other room adjacent to the operating room and is placed upon the operating table. A hypodermic injection of 1/6 gr. of morphine sulphate and 1/150 gr. of scopolamine hydrobromide is then given and absolute quiet maintained. At the appointed time, when all arrangements for operation have been completed, the operator and assistants scrubbed and ready, the patient, her eyes lightly covered, is wheeled into the operating room in which silence is maintained. The abdomen is gently swabbed with iodine followed by alcohol and then draped. Preoperative catheterization is not necessary. A line of incision 12 cm. long, extending from three cm. above the umbilicus to 9 cm. below it and about 2 cm. to the right of this point is then anesthetized with 1/2 per cent novocain containing 10 minims of adrenalin to the ounce of solution. The skin, fascia, muscles, and peritoneum are in turn injected, slowly and painstakingly. The abdominal parietes are then incised, sponging being by gentle, quiet pressure, no wiping or rubbing being permitted. Bleeding is controlled by clamp and ligature and the peritoneum further injected with the anesthetic solution if the patient exhibits any evidence of pain. The fundus uteri now presses upward into the incision and a suture of No. 2 chromic catgut on a medium-sized curved needle is passed through the



fascia, muscle and peritoneum at the extreme upper angle of the incision. The needle now pierces the uterine wall, a little to the right of the incision, thus correcting the normal dextroversion of that organ. Peritoneum, muscle and fascia on the opposite side of the incision are now transfixed and the sutures tied firmly, the ends left long and held by a hemostat. The same maneuver is carried out at the extreme lower angle of the incision and when both sutures are tied and the hemostats attached to them are firmly held tight by an assistant, the anterior uterine wall is seen to be in intimate contact with the spread open parietal

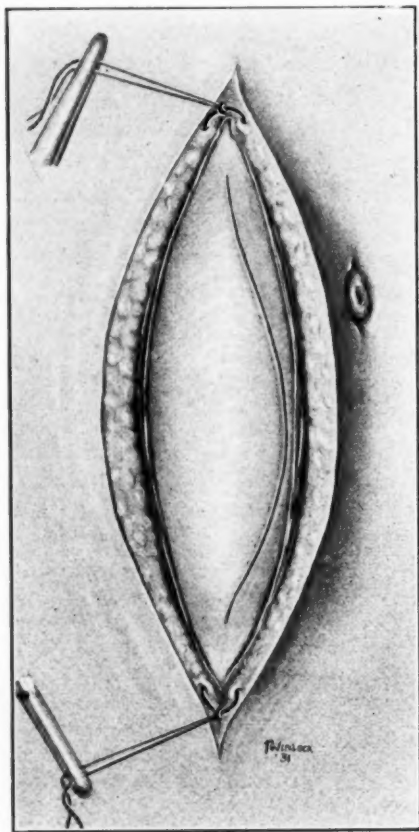


Fig. 1.

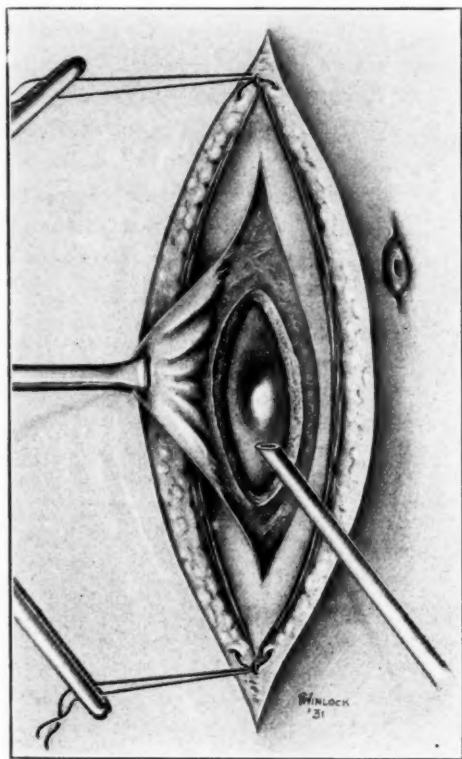


Fig. 2.

Fig. 1.—The abdominal incision showing stay sutures and the line of the proposed flap.  
Fig. 2.—The flap dissected back and the uterus opened showing the pouch of membranes.

peritoneum. No further infiltration is necessary, the uterine wall being insensitive to pain.

A semilunar incision just through the uterine serosa is now made extending from one of the stay sutures to the other. The center of the flap so begun is grasped by an Allis clamp and with a few snips of the scissors the flap is dissected well back beyond the proposed line of incision in the uterine wall. The musculature under the flap is now carefully incised until a pouch of membranes bulges up into the wound. The liquor amnii is then aspirated with a trocar, the fluid draining into a basin and so preventing spill and the soiling of the drapes.

The uterine incision is then lengthened by cutting and tearing with the finger until it is approximately 11 cm. in length, and the fetus is grasped by the feet and extracted in the usual manner, except that owing to the shortness of the wound, the shoulders and head must be delivered slowly and carefully, the head being maintained in flexion by a finger inserted into the mouth.

A hypodermic injection of 1 c.c. of pituitin (obstetric) and 1 c.c. of ergot is now administered and the placenta and membranes carefully withdrawn. The uterus is closed by tier suture, an inner layer of No. 0 chromic gut, a wide middle



Fig. 3.

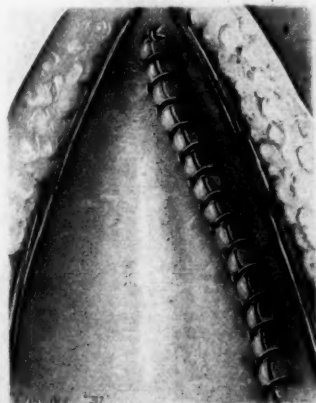


Fig. 4.

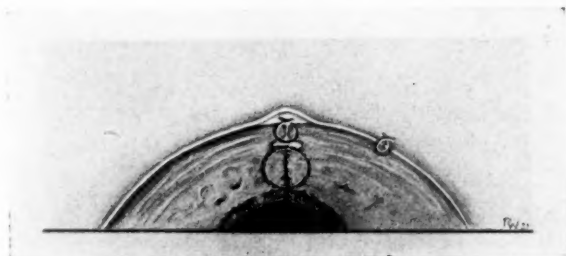


Fig. 5.

Fig. 3.—Showing closure of uterine wound.

Fig. 4.—Closure of visceral peritoneum.

Fig. 5.—Cross-section of abdominal wall showing relations of completed sutures.

layer of No. 2 chromic gut, and the flap is fastened back in place, entirely covering the uterine muscle incision by a No. 0 gut suture.

If the uterine muscle is very thick, or if bleeding is troublesome, mattress sutures of catgut may be required. At no time during the operation is the uterus eventrated, and the stay sutures are always held taut. No packing or walling off is necessary nor is the abdominal cavity sponged at any time. The stay sutures are now cut away, the uterus sinks into the abdomen, and the abdominal incision is closed by tier suture, an intracutaneous skin stitch, or skin clips being utilized. A firm occlusive dressing of adhesive plaster is applied to complete the procedure.

Patients so treated usually take light diet on the evening of the operation and are subsequently managed as ordinary puerpera, out of bed on the tenth day and discharged on the fourteenth. Two minor points should never be neglected. If the operation has consumed some time, it will probably be necessary to reinfiltrate the parietal peritoneum and the skin with novocain to prevent a painful closure. Second, the moment it is observed that the patient does not respond well to local anesthesia and begins to complain or to move, this method should be abandoned at once and nitrous oxide inhalation be commenced. An anesthetist, with gas apparatus should always be in attendance for this purpose. It is infinitely better surgery to admit the failure of local anesthesia early, than to prolong its use in a suffering, complaining patient.

1814 SPRUCE STREET.

### ADDITIONAL REPORTS ON THE SATCHEL HANDLE OPERATION FOR ARTIFICIAL VAGINA

("THE FORMATION OF AN ARTIFICIAL VAGINA BY A NEW  
PLASTIC TECHNIC")

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IN THE December, 1927, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, we described a new technic for the formation of an artificial vagina by means of tube flaps.<sup>1</sup> In the intervening time we have had the opportunity of operating upon three other patients for absence of vagina, in two of whom the original technic was employed. In the third an attempt was made to shorten the procedures but, as will appear from the history, the result was not as satisfactory. Dr. Stephen Rushmore, in a private communication, informed me (November, 1928) that the method had proved very satisfactory when using two tube flaps and that at no time was there any evidence of defective circulation in either flap. He reported that the immediate result was satisfactory. The present article deals with the follow-up of our original case and the description of additional cases.

CASE 1.—(Upon which our first report was based) A. Z., was operated upon on February 26, 1926. Physical examination showed a typically feminine individual, twenty-six years of age, married but divorced. The vagina was represented by a blind inelastic sac which could be indented for 1.5 cm. This canal was the result of a previous attempt at making a vagina at some other hospital. The full details of the operation we performed were given in our original communication. The patient remarried shortly after the artificial vagina was completed and has lived happily with her husband who, we gather, is unaware of her condition. She was last examined on March 25, 1931, at which time the vagina was found to be long, roomy, admitting a full size speculum. Most of the flap appeared intermediate in type, between mucosa and skin, the lower portion of the posterior flap still showing distinct evidence of its cutaneous origin.

CASE 2.—J. K., aged twenty-one, married, about to be divorced by husband because of impotentia coeundi. Admitted October 13, 1927. Physical examination showed a rather obese feminine individual with normal vulva, the vagina being represented by a very short blind vestibular pouch. In addition this patient showed polydactylism. Examination of the blood for the presence of female sex hormone demonstrated functioning ovaries.<sup>2</sup> By rectal examination no palpatory evidence of internal genitalia was demonstrable.

On October 14, 1927 the first stage was performed, a long skin tube ("satchel-handle") flap being fashioned from the inner side of the left thigh. On November 21 the flap was incised so as to liberate the distal pedicle. On November 28 the final stage of the operation was undertaken, the distal end of the flap being entirely severed, the tube reopened and implanted in a canal prepared at this time by

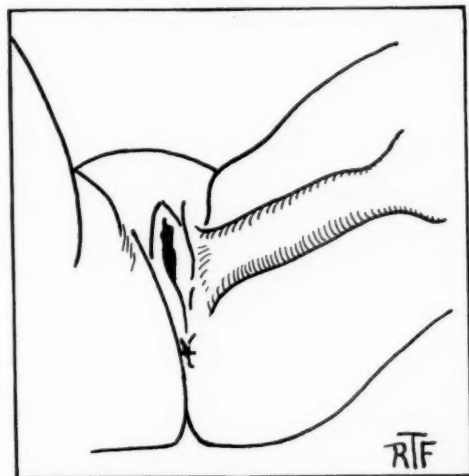


Fig. 1.—Healed tube flap from left thigh. Ready for severing distal pedicle and re-opening the tube for implantation.

separating the tissues between bladder and rectum. Fifteen days later the rubber plug was removed. On discharge, December 16, 1927, the vagina was found roomy and covered with viable epithelium. This patient was seen one year later, happily married, the vagina roomy and functioning. No further follow-up has been possible.

CASE 3.—R. L., aged twenty, single, in every way feminine and with strong sex urge. She was admitted to the hospital on October 13, 1928. The vulva was found normal. The blind vestibular pouch could be indented only 1 cm. No internal genitalia could be felt by rectal examination. A typical "satchel-handle" flap was fashioned on the left thigh on October 18, 1928.

This patient, like the first one, developed pyelitis, due to the indwelling catheter. The final stage of the operation at which the distal end of the flap was cut across, the tube reopened and implanted in a canal fashioned between the bladder and rectum, was performed on December 17, 1928. This patient was last seen in October, 1930. She was still single and had not indulged in coitus. The introitus was normal, the vagina admitted two fingers for  $1\frac{1}{2}$  inches. At this point a stricture had developed which was readily dilated as it was largely due to agglutination of opposing epithelial layers, and beyond this the vagina extended for another inch. This patient was instructed to occasionally pass a vaginal plug.

The following is the description of the operation in which we deviated from our original technic.

CASE 4.—E. S., aged twenty-two, was seen May 2, 1927. Face and general appearance were attractively feminine, but the hips were rather narrow. The vulva was normal. There was a slight dimple in the region of the fourchette which could not be indented. Per rectum a transverse band was felt high up in the pelvis and far out on the left side a gonad (?) could be felt. At the age of twelve a laparotomy had been performed on this patient, but we were informed that no biopsy on the sex gland had been done, and consequently the sex of the patient was as yet undetermined. However, examination of her blood, continued over a long period, showed cyclical accumulation of female sex hormone,<sup>2</sup> which we interpret as definite evidence of the presence of functioning ovaries. We essayed to shorten the time required for the construction of an artificial vagina by making club shaped skin flaps, the base of which reached to the labium majus, 5 inches by 2½ inches, fastening these to a Ferguson speculum by means of sutures, and at once implanting them in the new formed canal prepared between the bladder and rectum. The flaps were introduced without tension and a considerable portion of the flaps healed in. Neither their base nor the epithelial covering however showed the resistance so plainly manifested by the tube flaps used in the other cases. In consequence of this vulnerability, areas were constantly breaking down, and, due to retraction, the apex of the artificial vagina became denuded and covered with granulations. Repeated skin grafts, both Thiersch and Wolf, were implanted over a period of more than a year and for a long time this vagina showed a tendency to shrink. However, treatment continued throughout the second year after the primary operation resulted in the formation of a satisfactory vagina. This patient is now happily married for nearly a year.

It has seemed to us worth while to again report the excellent and permanent results of the tube flap technic which enables the formation of a permanent, functioning artificial vagina by a procedure unattended by serious risk. Evidence that the tubulation endows the subcutaneous tissue and epithelium utilized for the formation of an artificial vagina with great resistance to trauma and interference with the blood supply is afforded by the difference in course between the cases operated upon by means of tube flap and the solitary case in which direct flap introduction was attempted. The only technics which can be considered in competition with the tube flap technic are the utilization of an intestinal loop (technic of Baldwin<sup>2</sup>) or the transplantation of the lower segment of the rectum (technic of Schubert<sup>3</sup>) both of which require transection of the intestine with its attendant dangers.

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## REFERRED PAIN OF URETERAL ORIGIN\*

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THE interesting phenomena of referred pains have always been both helps and hazards to differential diagnosis. Not so widely recognized as the distant pain of angina pectoris and gall bladder disease are those initiated by ureteral pathology, notwithstanding the early observations of Dietl and the later insistence of Hunner. We accept without question, however, the spectacular Dietl's crisis; we are skeptical of or utterly oblivious to the milder distress signals of the ureter.

My own still unsatisfied curiosity about the ureter was aroused five years ago by a patient in the Gynecologic Dispensary of the Woman's College Hospital.

Mrs. E. S., aged thirty-six years, came complaining of pain in the lower right quadrant, right lumbar backache, attacks of mucous diarrhea, and sciatica. When the "sciatica" was at its worst, the pain shot down to her right heel. Her only urinary symptom, occasional painless frequency, had not impressed her as a complaint. The onset of her symptoms followed a forceps delivery fourteen years before. In an effort to get well, she had submitted to three laparotomies. Her appendix first, then her gall bladder, and finally her right tube and ovary had been removed. In the meantime she had lost several teeth to clear up the sciatica, and was wearing corrective shoes for the pain in her heel. She had spent her substance on specialists, and had descended to our clinic unrelieved.

On vaginal examination, a thickened tender right pelvic ureter was felt, pressure upon which reproduced the right groin pain, shooting to the right lumbar region and down the back of the thigh. Cystoscopy showed a bladder normal except for a very small rigid right ureteral meatus, which admitted a No. 5 catheter with difficulty. The passage of the catheter through the first 3 cm. produced first the local pain, then the "sciatica," and then to our amazement, the pain in her heel. She had 14 c.c. residual urine in her kidney pelvis, and the injection of 15 c.c. of 0.5 per cent silver nitrate solution into the ureter reproduced the right lumbar pain with nausea, and precipitated an attack of diarrhea.

So pyrotechnic a display of symptoms apparently arising from irritation of the ureter demanded an explanation. A search of the literature at that time was disappointing, except for frequent references in Hunner's articles to "the leg pain of ureteral stricture," and chronic indigestion from the same cause. Even Hunner, however, did not pause to explain his observations.

The frequency of this disturbance must be evident from a study of 1,164 urologic cases made in the dispensaries of the College and Woman's Hospitals and in private practice in the past five years, in which an incidence of 471 proved cases of referred ureteral pain was noted.

\*Read at a meeting of the Philadelphia Obstetrical Society, May 7, 1931.

Following are brief reviews of typical cases:

Mrs. E. H. (27196), College Hospital. Chief complaint: nervous indigestion, for which she had been treated in several clinics, and given bromides until she was covered with the rash. Location of pain, near McBurney's point. Referred to the right lumbar region and down the outer anterior thigh. In making the pyelogram we overdistended the ureter slightly, causing her pain with its references, and the nauseating quiver in her epigastrium for which she had taken the bromides. All the symptoms were exaggerated in the upright position. Diagnosis: right renal ptosis. Treatment: the patient was fitted with a belt and referred to the Family Society for more food. Result: ten pounds' gain in the first month, with disappearance of all symptoms.

Mrs. H. H. (B. 1568), Woman's Hospital. Complaint: pain in the right side, right backache, frequency of micturition, pain down the inner anterior thigh, with attacks of nausea and vomiting when the pain was worst. No bladder inflammation. No obstruction to the passage of the catheter, but reproduction of the pain by filling the kidney pelvis, with nausea in the upright position. Urogram showed ptosis. A belt had given her much relief.

A. R. (9867), College Hospital. Sent in for appendectomy. Referred to Urological Clinic by an alert interne because of transmission of her pain from McBurney's point down the inner and anterior surface of her thigh, and a history of frequency of micturition. Urogram shows ptosis with rotation and beginning hydronephrosis. Treatment: appendectomy. Pathologic report: chronic obliterative appendicitis. Result: relief while in bed. Returned to clinic one month after operation with all her old symptoms.

Mrs. A. B. (A54156), Woman's Hospital. First seen with acute pyelitis of pregnancy. Frequent recurrent attacks. Pain located in the right costovertebral angle, referred around the crest of the ilium, down the outer anterior thigh, epigastric discomfort, flatulence, constipation. The pyelographic procedure reproduced her symptoms, and the plate shows her lesion: ptosis with a kink of the middle ureter. She has had no trouble since wearing a belt and gaining some weight.

Mrs. C. C. (A62831), Woman's Hospital. Complaint: pain in the lower left side, dyspareunia, pain down the back of the left thigh, left lumbar backache, and slight nausea. Rolling a tender cord-like ureter under the finger reproduced the discomfort of intercourse, and sent a pain down the back of the thigh. Cystoscopy showed a stricture of the left vesical ureter and the urogram a mild left renal ptosis. She has been entirely relieved by dilatation of her stricture.

Mrs. E. O. (B3791), Woman's Hospital. Complaint: pain in both sides, both lumbar regions, the front of the left thigh and the back of the right. Findings: bilateral ptosis, with additional stricture of the right vesical ureter. She is improving under treatment.

E. S. (B3615), Woman's Hospital. Complaint: pain in both groins, both lumbar regions, down the back of both thighs, with chills and fever. Cystoscopy showed bilateral pin-point ureteral meatuses, admitting at first only No. 4 bougies. Dilatation was kept up until No. 9 bougies passed easily. This urogram was made after the attack subsided, showing dilatation of both pelves and ureters. Recently she returned in another attack for which we blame stasis in her atonic ureters. This time she had only the lumbar pain, and pituitrin has reduced her fever. We have stood by her bed after a hypodermic, watching the pituitrin whip her ureters into activity, as manifested by local and anterior thigh pain.

Two more cases, both in young girls with the lateral dysmenorrhea of strictured vesical ureters. F. F. had pain in the right side and down the back of the right thigh, with vesical irritability before menstruation, but no pyuria. She has been

permanently relieved by dilatation of her lower right ureter. J. B. had a similar condition on the left with a similar result.

That the reverse of the picture is true, and the absence of these pains may be as significant as their presence, is illustrated by the last case, J. W. (10323), College Hospital. Cystoscopy showed golf-hole ureteral meatuses, with vesicorenal reflux. The uroselectan plate confirmed the findings. Although she had bilateral infected hydronephrosis with a marked constriction of her right ureter, she had no pain. Her atonic ureters had ceased to protest.

#### SUMMARY AND CONCLUSIONS

1. Study of the nerve supply of the ureter shows theoretically that pathology of the upper ureter may manifest itself by gastrointestinal disturbances, and also by pain felt in the surfaces supplied by the intercostal and lateral cutaneous nerves; that the middle ureter may cause pain in the distribution of the lumbar nerves, over the vulva and the front of the thigh; and that the pelvic ureter may produce sciatic pain.

2. The proof that these pains are of ureteral origin has been obtained by reproducing them with the manipulation of the ureter, and by relieving them when it was possible to cure the suspected pathology.

3. The incidence of this referred pain of ureteral origin is 40 per cent of all our recent urologic cases.

4. We wish to emphasize the fact that comparatively so few of these patients presented obvious urinary symptoms as their chief complaint; that so few of them, even with vesical irritability, showed either pyuria or fresh inflammation of the bladder or urethra. The key to their causative lesions was the interpretation of their pain. Hence we believe that awareness of the repercussions of ureteral pathology as manifested by referred pain will elucidate many a cloudy diagnosis and obviate much medical and surgical therapy which has proved, for the patient, at least, beside the point.

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(For discussion, see page 297.)

## REPORT OF A CASE OF OVARIAN PREGNANCY WITH COMMENTS ON ITS ETIOLOGY\*

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THE possibility of ovarian pregnancy has long been a controversial subject. Since the publication of C. van Tussenbroeck's classical case of ovarian pregnancy in 1899, many other reports have appeared in medical literature, indicating beyond doubt that true ovarian pregnancy occurs and has a place in gynecologic pathology. It is difficult to estimate correctly the total number of authentic cases among those published. Reviewing a total of 87 cases in the literature, not more than 48 of them can be definitely classified as true ovarian pregnancies. The other 39 are questionable, because they either fail to comply with the requirements necessary to establish the diagnosis of ovarian pregnancy, or they do not include convincing microscopic data.

The following case is reported because of certain unique features in the clinical history:

The patient was thirty-five years of age. She had a normal delivery at the age of nineteen, and did not conceive for sixteen years after that. Menstrual history: twenty-six-day type, very scanty flow, two days' duration, accompanied by severe headaches, without abdominal pain. In April, 1930 menstruation was delayed for ten days. She then went to a midwife, who performed a curettage. Following the curettage, the patient bled for three weeks continuously, but did not have any abdominal pain. In June she became suddenly ill and experienced sharp pains in the right lower abdominal quadrant. Her doctor sent her to a hospital with a diagnosis of ovarian abscess. She remained in the hospital for two weeks on conservative treatment, consisting chiefly of ice bag applications to the abdomen. Her hospitalization was complicated by severe tonsillitis with moderate elevation of temperature. She was discharged from the hospital somewhat improved, but with persistent pain in the right lower quadrant.

I first saw the patient three weeks after she left the hospital. Her temperature was then normal, pulse 92 and she appeared to be markedly anemic. There was moderate tenderness over the right lower abdomen. Vaginal examination revealed a scanty bloody discharge. The uterus was somewhat enlarged, not particularly soft, and displaced to the left, in ante flexion. The right side was moderately sensitive and contained a fluctuant mass, the size of a fist. The left adnexa were negative.

The clinical history and the finding of a unilateral adnexal tumor aroused the suspicion of an ectopic pregnancy and operation seemed indicated. Under ether anesthesia a mid-line incision was made. The omentum was found drawn down and attached to the right adnexa, but was easily freed and the right adnexa brought into view. The fallopian tube was about 8 cm. long, somewhat thickened and continuous with a large, round tumor measuring 7 by 9 cm. The tube could be traced distinctly on the upper edge of the tumor, and its fimbriae were spread

\*Read before the Section of Obstetrics and Gynecology of the New York Academy of Medicine, February 24, 1931.

out over its lateral surface. The tumor occupied the site of the right ovary and was attached to the uterus by the ovarian ligament. A long, thickened appendix was found adherent to the posterior surface of the tumor. The mass had a brownish color and was fluctuant. In attempting to deliver the tumor into the abdominal wound, it ruptured at the point where the appendix was adherent to it, and a small blood clot appeared in the opening. The right adnexa were removed by clamping, cutting and ligating the infundibulo-pelvic ligament, the mesosalpinx, and the proximal end of the tube. The uterus and left adnexa were found to be normal. The inflamed appendix was removed in the usual manner.

Recovery was uneventful and the patient left the hospital twelve days after the operation.

Macroscopic inspection of the extirpated tumor suggested that the preoperative diagnosis was incorrect, as it closely simulated a chocolate cyst or endometrioma of the ovary. But when the tumor was incised, an irregularly shaped sac was found in the central portion and this was lined with a glistening membrane. The sac itself was



Fig. 1.—A photograph of the gross specimen. The irregularly shaped sac may be seen in the central portion of the tumor. On the right side, the lining membrane is partly detached. In the right upper corner the stump of the uteroovarian ligament can be identified.

filled with fresh blood, and the membrane could easily be detached from the surrounding tissue.

The criteria of ovarian pregnancy as formulated by Spiegelberg and Werth are: (1) The tube on the side of the pregnancy must be intact; (2) the fetal sac must occupy the position of the ovary; (3) the ovary must be connected with the uterus by the uteroovarian ligament; and (4) definite ovarian tissue must be found in the wall of the sac. As this specimen complied with all these requirements, further steps were taken to justify the diagnosis. Several blocks were taken from the tissues adjacent to the fetal sac, and these sections showed the sac to be entirely surrounded by ovarian stroma. Practically the entire specimen was dissected and several follicle cysts were found in the stroma. There was no trace of a corpus luteum.

Two types of ovarian pregnancy are recognized: (1) the intra-follicular type and (2) the superficial type: or as Sutton classifies them the primary and secondary type. The primary type is one in



which the fertilized ovum undergoes its development entirely within the ovary: the secondary is one in which the ovum, following its fertilization, undergoes a certain stage of its development in some nearby structure or cavity, usually the fallopian tube, and then becomes implanted in the ovary. I believe that Sutton's classification is correct, because the ovary has only one structure which is adapted to the nidation of the fertilized ovum, this being the epithelial lined cavity of the graafian follicle. Hence, only the intrafollicular type can be considered as a true ovarian pregnancy, since the superficial type is most likely the result of a secondary nidation.

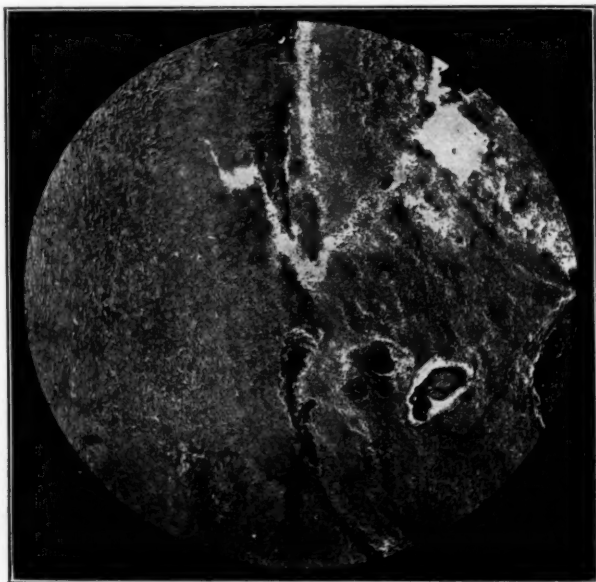


Fig. 2.—A photomicrograph of a section taken from the tissue surrounding the sac. The ovarian stroma is visible on the left side. Several chorionic villi can be seen to the right and below.

The microscopic study of the specimen taken from my patient demonstrated the primary type of ovarian pregnancy.

The macroscopic diagnosis of ovarian pregnancy, especially that of the intrafollicular type, is extremely difficult because, (1) this type of ovarian pregnancy has little tendency to rupture, (2) because the tumor closely resembles a chocolate cyst. In cases of intrafollicular conception, the spermatozoon enters the ruptured follicle, fertilizes the ovum within the follicle, and following this, the site of the rupture closes and the fertilized ovum continues its development. The intrafollicular continuance of the pregnancy stimulates the connective tissue of the ovary and shortly thereafter the ovum becomes surrounded by ovarian tissue. After the ovum reaches a certain developmental stage, it usually dies because of extensive bleeding in the

wall of the fetal sac and chorion frondosum, resulting in the formation of a blood mole within the ovary. This sequel of an intrafollicular pregnancy explains the rarity of a ruptured true ovarian pregnancy. On the other hand, an unruptured ovarian pregnancy presents the same appearance and characteristics as the so-called chocolate cyst. A differential diagnosis is only possible by a thorough microscopic study of the specimen.

I believe that ovarian pregnancy is not as rare as the comparatively small number of reported cases would indicate, but that, due to its simulation of a chocolate cyst and also to the lack of thorough micro-

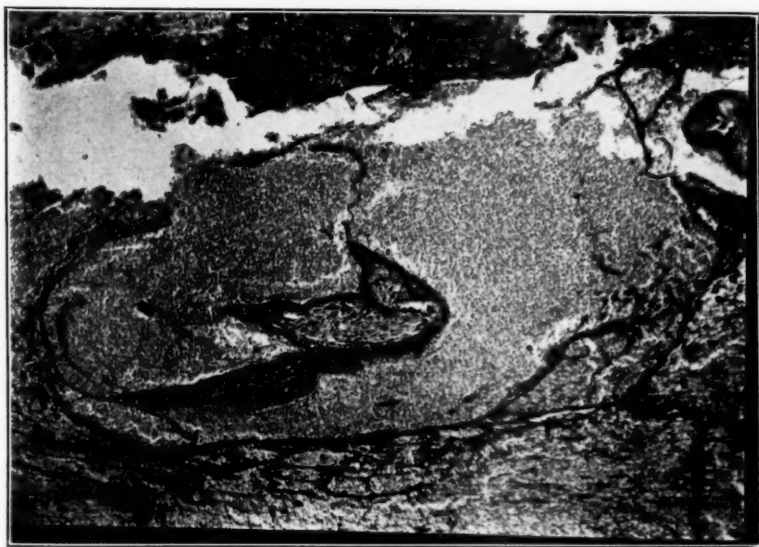


Fig. 3.—A photomicrograph of the chorionic villi under high power.

scopic examination of these tumors, a good many cases are unrecognized.

The etiology of ovarian pregnancy has not been satisfactorily explained as yet. In these cases there is a pathologic alteration of the ovulation processes. For some reason the ovum does not leave the follicle after the rupture has taken place, and this is accounted for in two ways. One theory postulates that the occlusion of the rupture by a small blood clot makes the expulsion of the ovum impossible. This idea is unsatisfactory, because such an occlusion would also preclude the entrance of the spermatozoon into the follicle. The second theory assumes that if the ovum in the ripening graafian follicle is dislocated, so that it does not get into the stream of the escaping liquor, it may be retained in the follicle. This explanation is also improbable, first, because the clinical features of an ovarian pregnancy do not comply with such a supposition, and secondly, because microscopic

studies of the ovulation, made in an extensive series of cases by Strassmann, do not demonstrate such pathologic condition within the follicle.

To study pathologic ovulation is extremely difficult, as only those cases which eventuate in an ovarian pregnancy come under observation. There is reason to believe however, that the pathology of ovulation is not of rare occurrence. Considering the difficulties which a spermatozoon encounters passing through the uterine cavity and tube it is safe to assume that it arrives at the ovary with a greatly impaired vitality. It is also probable that only in a small number of the cases can the spermatozoon fertilize the ovum within the follicle, and that there is a much larger percentage of pathologic ovulation, which because they do not result in ovarian pregnancies and because of the absence of annoying clinical symptoms, pass unrecognized.

One point in the clinical histories of reported cases of ovarian pregnancy may afford a clue to the etiology. This important factor is the long-standing sterility previous to ovarian pregnancy. Sutton and Bass report cases in which the patients were never pregnant prior to the ovarian pregnancy, although married for six or seven years. In my case the ovarian pregnancy was preceded by sixteen years of barrenness. Liebe reports a similar period of twelve years. These long periods of sterility cannot be considered as mere coincidences, but demonstrate that the pathology was not confined to a single graafian follicle, and that the whole ovary was involved. This led to pathologic ovulations in each of the graafian follicles. The pathology consists of a changed mechanism of ovulation: the follicles do not discharge the ovum, the ovum remains within the follicle, and perishes there, except in these rare cases in which fertilization takes place within the follicle.

It is therefore logical in seeking the etiology of ovarian pregnancies, to discover first the nature and causes of the pathology that bring about the retention of the ovum in each graafian follicle.

A reasonable conception of this is the following. In the process of physiologic ovulation, after rupture has taken place, a certain amount of force is required to free the ovum from its attachment to the cumulus oophorus cells and to expel it from within the follicle. The power of this force depends on two factors. The first is the intra-follicular pressure, and the second is the resistance of the surrounding tissue. The resistance of the surrounding tissue is dependent upon the thickness and special structure of the membranous wall. Any pathologic alteration that involves the tunica albuginea is likely to produce an increased resistance of the follicle wall. One can imagine that such changes in the superficial layer of the ovary affect the physiologic mechanism of the ovulation. In normal cases the sudden change in the tension of the follicle supplies the force which is required to liberate the ovum. When, however, the follicle wall's resistance is in-

creased, the extent of the rupture will be much smaller and the liquor will not escape with a sudden gush, but will dribble away slowly, thus not having sufficient momentum to free the ovum and flush it into the abdominal cavity. This pathologic mechanism might be called the slow-rupture of the follicle, which is intermediate between nonrupture and physiologic rupture of the follicle. I think, therefore, that the nature of the pathology, which causes the ovum's persistence within the follicle, must be sought in a structural change of the ovarian surface, such as is found in cases of chronic oophoritis.

That the thickening of the tunica albuginea must play a part in etiology of ovarian pregnancies is evidenced by certain microscopic findings. Observers who made a careful microscopic study of their specimens found that those portions of the tumor, which showed intact ovarian stroma, were richly filled with follicle cysts of various sizes. My microscopic slides confirm these findings. The follicle cysts are nonruptured graafian follicles, which could not rupture because they met too much resistance of the tunica albuginea. Occasionally the ripening follicle may reach the ovarian surface on an area which offers comparatively less resistance, so that it does rupture but with a changed mechanism, as previously explained.

Summing up the deductions derived from the clinical and histologic features of ovarian pregnancy, it may be said, that the pathology is not confined to a single graafian follicle, but involves the whole ovary. Structural changes of the ovarian surface bring about greater resistance of the follicle wall, and this leads to nonrupture, or to a small rupture with a slow dribbling away of the liquor folliculi, which we call slow-rupture. The ovum therefore is not subjected to the required force, which can free it from its attachments and expel it into the abdominal cavity. The ovum remaining in the follicle, the patient becomes sterile, unless under the influence of favorable circumstances the ovum becomes fertilized within the follicle.

I believe that this theory explains the clinical and histologic features of ovarian pregnancies, and hope that further investigations of chronic oophoritis will provide more definite data and prove the correctness of this viewpoint.

#### CONCLUSIONS

1. The macro- and microscopic examination of my specimen proves it to be a true ovarian pregnancy.
2. I believe, that due to the tumor's great resemblance to a chocolate cyst and because of the lack of sufficient microscopic examinations, a great many similar cases of ovarian pregnancy are overlooked.
3. The etiology of ovarian pregnancy is predicated upon a pathologic ovulation of the graafian follicles, and this probably is caused by structural changes in the ovarian surface.

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## CARCINOMA OF THE BARTHOLIN GLAND

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PRIMARY carcinoma of the Bartholin gland is a very rare occurrence. The total number of cases reported in the literature to date is probably not more than forty. However, much of the common impression that malignant tumors of the Bartholin gland are relatively rare might be due in part at least to the high percentage of error of diagnosis. Schweizer<sup>1</sup> in 1893, described a tumor located in the right labium majus in the case of a fifty-year-old woman; this tumor was erroneously diagnosed as an inflamed Bartholin gland. The tumor was excised but it recurred three years after removal and at this time it was found to infiltrate the pubic bone. On microscopic examination the tumor consisted essentially of nests of cells enclosed in a connective tissue network. The tumor cells were small, epithelioid and polyhedral in structure and contained a relatively large hyperchromatic nucleus. In 1904 Frisch<sup>2</sup> described a tumor of the Bartholin gland which histologically had a papillary pattern; the epithelium lining the papillae was several layers thick and the nuclei were small, hyperchromatic and situated at the base of the cells. Some of these cells assumed the character of goblet cells. In certain areas of the tumor there were also found solitary cysts lined with epithelial cells that closely resembled those of the normal Bartholin gland. Normal glandular structure was entirely absent however in this tumor. Since the publication of these cases other instances of similar tumors were reported, and in 1923, Falls,<sup>3</sup> and in 1930 Schneider,<sup>4</sup> each presented a fairly inclusive bibliography and summary of the literature up to that date and also added a case of his own.

The object of this paper is to summarize the principal observations in a pathologic study of a case of carcinoma of the Bartholin gland



which has been observed at the Missouri Baptist Hospital, and to present for convenience of reference a summary covering the subject.

#### CASE REPORT

The patient, M. S., a white female, aged seventy-one years entered the Missouri Baptist Hospital on August 27, 1930, complaining of swelling of the right labium majus. She had had no previous serious illnesses excepting for a right inguinal hernia for which she was operated upon forty years ago. There had been no vaginal discharge. She complained of frequency of urination and nocturia but no dysuria of any kind. She had been somewhat constipated and subject to frequent colds.

The present illness began three years ago when the patient first noted a painless swollen mass in the right labium majus, which gradually increased in size and be-



Fig. 1.—Photograph of the gross appearance of the tumor of the Bartholin gland. A shows the external capsular surface of the tumor and B, the cut surface.

came painful. As time passed on the pain became more severe in character and also more constant. At no time was there any discharge coming from this swollen mass. Because of the steady increase in the size of the tumor and the constant pain that was associated with it the patient entered the hospital seeking relief from the above symptoms; her health otherwise was unimpaired.

*Physical Findings.*—The patient was a fairly well-developed and well-nourished white female of about seventy years old.

A mass occupying the lower two-thirds of the right labium majus, bulged over the introitus and almost obliterated the vagina. It also extended inward along the anterior surface of the lower rectal wall for a distance of about two inches from the anal orifice. The mass was irregular and nodular in outline and mostly firm in consistency. Certain portions, however, were softer than others and showed definite fluctuation. The skin overlying this swollen mass was reddened, the redness was also apparent over the proximal portion of the thigh. There was no ulceration of the surface. The tumor was quite tender to the touch and it was not firmly attached to the skin anteriorly or to the rectum posteriorly. The cervix and uterus were

normal; the adnexa were not palpable. The inguinal lymph nodes were not markedly enlarged.

A preoperative diagnosis of a possible abscess of the Bartholin gland was made. Operation was performed on August 30, 1930. An incision was made over the right labium majus and a tumor the size of an orange was readily delivered. The wound was then closed and an uneventful recovery followed.

*Pathologic Examination.*—The tumor was spheroidal in shape measuring  $8.5 \times 7 \times 3.5$  cm. The surface was irregular and nodular in outline but the tumor appeared well encapsulated and very firm in consistency. (Fig. 1.) Cut section of the tumor disclosed a greyish white surface upon which fine interlacing bands of connective tissue could be seen separating the parenchymatous tissue into irregular lobules. There was no gross evidence of any necrosis in the tumor although certain portions appeared slightly cystic and hemorrhagic.

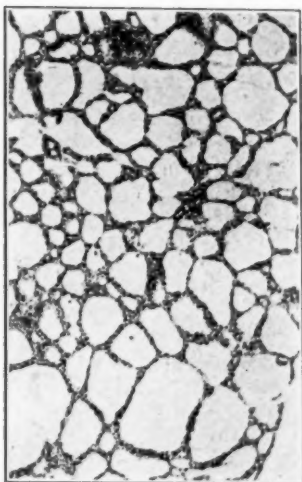


Fig. 2.

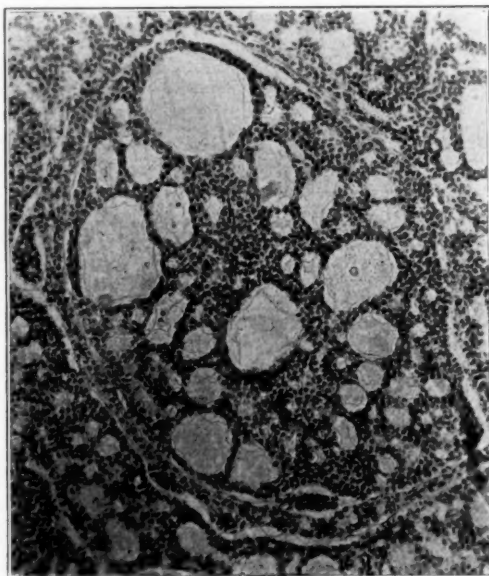


Fig. 3.

Fig. 2.—Low power photomicrograph of the tumor showing its acinar structure and its resemblance to thyroid tissue. There is very little connective tissue stroma present in the tumor.

Fig. 3.—High power photomicrograph of the tumor showing again its acinar structure and tendency to lobulation.

*Microscopic Examination.*—Microscopically, the tumor consisted of masses of epithelial tissue of various size separated from each other by thin bands of connective tissue. A cursory examination of the tumor with the lower power ocular disclosed a very striking resemblance of the tumor to malignant thyroid tissue in so far as the architectural arrangement of the acini and the lining epithelium was concerned. (Figs. 2 and 3.) However, a careful examination particularly with the high power ocular revealed the true histologic nature of the neoplasm. The tumor as a whole was very cellular and contained only a strikingly small amount of fibrous tissue stroma. Necrosis was entirely absent, and although the growth was regarded as carcinomatous in structure, the cells did not penetrate far into the deeper tissues. The greater bulk of the individual nodules was composed of acini lined mostly with only one layer of cuboidal epithelium. The cells were charac-

terized by a cylindric shape, a small amount of cytoplasm, a large amount of nuclear material which took the shape of the cell and stained intensely. The acini varied in size, some were very small while others assumed considerably larger dimensions and gave the impression of little cyst formation. The lining epithelium of the larger dilated acini was very low and in places flattened out acquiring there

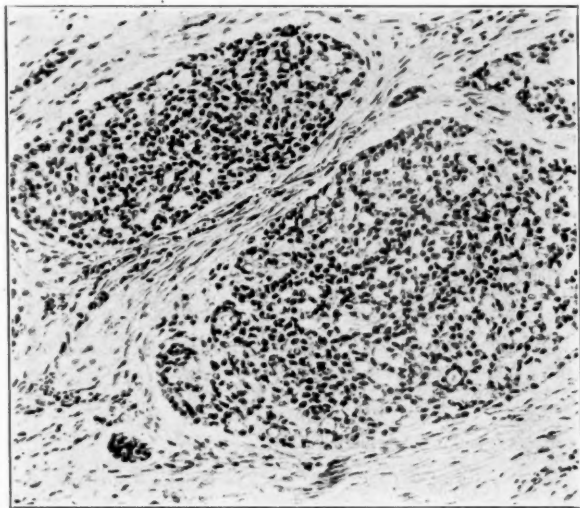


Fig. 4.—Infiltration of cancer cells into the capsule that surrounded the tumor. The capsule consisted of a dense layer of fibrous tissue.

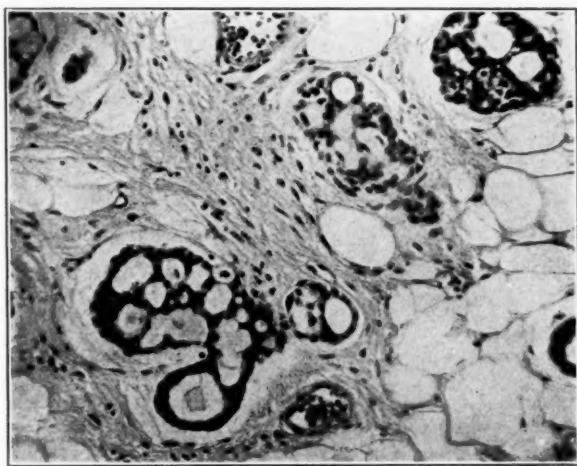


Fig. 5.—Diffuse infiltration of the lymph spaces with tumor tissue.

an almost linear dimension. The lumen formed by most of the acini was clear; others, however, were filled with either pink stained fluid or desquamated epithelial cells. It was the latter type of acini seen under the low power ocular that suggested a resemblance to thyroid tissue. In other parts of the section the cells were aggregated into solid nests losing thereby their acinar structure and presented no definite histologic pattern. Mitotic figures were rather infrequent. The blood

vessels were not prominent and relatively few in number. In the capsule surrounding the tumor there were found scattered areas of tumor tissue. Some of the latter were found to invade the lymph spaces. (Figs. 4 and 5.)

In summarizing the salient points of this tumor particular emphasis must be laid on its definite encapsulated form, its large size and its origin from the acinar portion of the Bartholin gland. The striking similarity of the tumor to malignant thyroid tissue should also be mentioned. A lack of appreciation of the normal anatomy and histologic characteristics of the gland may therefore lead to erroneous conclusions as to the true origin of the growth. However, by exercising special care in a complete study of the various sections, a correct diagnosis can readily be made.

#### DISCUSSION

Correct early diagnosis of malignant tumors of the Bartholin gland are made probably less frequently than of malignant tumors involving any other organ of the body. Carcinomas arising however from the Bartholin gland possess a distinct and characteristic structure which can readily be recognized and differentiated from that of tumors arising from other glandular organs. The normal histology of the Bartholin gland is that of a compound acinous structure. The acini are lined with either cuboidal or columnar epithelium while the ducts are lined with squamous epithelium. It becomes obvious therefore that two histologically different types of carcinoma may occur in the Bartholin gland, namely, (1) a columnar and (2) a squamous cell carcinoma. According to Sitzenfrey<sup>5</sup> also, the normal transitional and columnar epithelium which lines the deeper portions of the ducts may be replaced by squamous epithelium in the presence of a chronic gonorrheal infection. Under such circumstances a squamous cell carcinoma may also arise from the deeper structures of the duct.

Tumors of the Bartholin gland often present such a typical course that it is apparent that there are several factors present in such cases which combine to produce an unique chain of symptoms. The tumor usually manifests itself clinically in the form of a painless swollen mass in the labium; this is accompanied by edematous infiltration of the adjoining soft tissues. With the advance of the disease pain and tenderness may also occur, the latter at times is very severe in character and may radiate out to the back or to the groin. There is a wide variation in the size of the tumor, its invasion of the surrounding tissues and in the microscopic findings when such are reported. The skin overlying the tumor may become tense and stretched; very often there is a tendency to ulceration, the tumor is then tender to palpation. As the disease progresses all the symptoms become aggravated. The pain may become more constant, and as infiltration of the surrounding tissues occurs the patient complains of drawing pains at the

site of the tumor; the latter is also tender on pressure. If secondary necrotic changes take place in the center of the tumor, it will fluctuate and give then an erroneous impression of an abscess of the gland. Because of the very rare occurrence of these tumors, they are as a rule, not accurately diagnosed, particularly in the presence of necrosis and secondary superimposed infections, both of which changes are very apt to occur. In the latter instances they are frequently interpreted as abscesses instead of tumors of the gland. The growth however usually progresses steadily and without periods of regression in size such as are usually seen in Bartholin gland enlargement of inflammatory origin. Furthermore, the surface of a malignant gland is more apt to be irregular and nodular than when enlargement is due to inflammation; the irregular nodules may be readily palpable. Later in the disease the tumor may become large, hard, and immovable. The skin over the tumor becomes red and adherent to it. Metastatic deposits are most frequent in the inguinal lymph nodes but they may also occur in the pelvic bones, adjacent tissues and even as far distant as the brain. This type of tumor may cause only local pressure symptoms or it may involve surrounding structures and metastasize to distant organs thus placing it in the class of malignant neoplasms.

Anatomically these tumors can usually be traced to the acinar or duct portion of the Bartholin gland from either or both of which they may arise. Both in architectural arrangement and in cytologic detail, they almost regularly have features in common with the Bartholin gland epithelium and consequently they may readily be recognized as having arisen from the gland. In the case of the tumor presented in this paper, the parenchyma was made up of specific tumor cells which approached very closely the mother tissue. The morphologic relation of the various components of the growth were very similar to that seen in the Bartholin gland and hence there was no doubt as to the exact source of origin of the neoplasm. A striking feature of this growth was its resemblance to malignant thyroid tissue, and is therefore of particular histologic interest. The duct element of the gland was uninvolved in this case, but in cases where it also participates in the formation of the tumor it adds another phase to the picture by introducing another type of cell, namely, that of a squamous cell carcinoma. Because of the two different kinds of epithelial cells that are found in the Bartholin gland, it is not surprising to find here two histologically different types of growth, namely, that of columnar and squamous cell carcinoma. This condition is analogous to that found in neoplasms arising from the cervical portion of the uterus.

The authors of previously published reports have indulged in various speculations as to the etiology and pathogenesis of the disease. Since gonorrheal infections of the Bartholin gland are most frequent, one is prompted to accept such infections as the responsible factors



for the diseased process. The etiologic theories for the association of gonorrhea with carcinoma of the Bartholin gland form perhaps the basis for some of the studies which have been made in this connection. It does not seem necessary however to prolong much further comment on the numerous theories associating infections with neoplastic formations. Infections are so usually a concomitant feature of this disease that it is mentioned in nearly all pathologic discussions. The fact that infections with gonococci are common in the Bartholin gland is not sufficient evidence to indicate that the former are the determining factors of the disease. There has been considerable direct and indirect evidence to indicate that such is not the case, and in the case of the patient reported above the question of gonorrheal infection could be entirely ruled out.

So far as treatment is concerned, early thorough operation offers perhaps the best chance of complete cure. When the tumor is still in the intracapsular stage and metastasis has not already taken place, complete resection of the entire growth gives the best results. A common source of failure in surgical procedure is the surgeon's inability to recognize at operation the malignant character of the neoplasm. In cases of nodular tumors of the Bartholin gland in patients of the cancer age in which there is some doubt as to the malignancy or non-malignancy of the tumor, the operation must be radical to the extent of removing every portion of the involved tissues. The pathologist must be on the alert to distinguish these proliferating tumors from ordinary slow growing adenomas or from more common inflammatory processes of the gland.

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I am indebted to Dr. H. M. Moore for his permission to publish this case. I wish also to express my appreciations to Dr. H. A. McCordock of the Department of Pathology of Washington University for making the photomicrographs used in this publication.

3720 WASHINGTON BOULEVARD.

## RUPTURED CORPUS LUTEUM CYST, WITH MARKED INTRAPERITONEAL HEMORRHAGE

BY LOUIS RUDOLPH, M.S., M.D., CHICAGO, ILL.

**M**RS. M. S., twenty-five years of age, married ten years. Multiparae. Two previous pregnancies, labors, and puerperae uneventful. Five years ago had a similar attack, but recovered in four or five days. Last regular menstruation began on December 8, followed by irregular vaginal bleeding to the onset of this complaint, instead of the usual four- to five-day flow.

On December 22, while motoring she was seized with a sudden severe pain in the lower abdomen with difficult and painful urination, and a feeling of pressure on the rectum. A diagnosis of ectopic pregnancy or an acute exacerbation of a chronic salpingitis was considered and the patient treated expectantly. On the morning of December 25, the patient was fairly comfortable.

On December 25, at 2 P.M., patient was seized with a sudden acute pain in the right lower quadrant of the abdomen radiating to the back and down both thighs. Became weak, dizzy, and nauseated.

The patient was seen at 3 P.M.; she was in bed and listless, marked generalized pallor, and an anxious expression. The skin was clammy, and beads of perspiration on the forehead. Rapid respiration and gasping for air. The abdomen was distended, generalized tenderness, and marked rigidity of both recti. Right shoulder pain. Vaginal examination showed a relaxed introitus, stellate lacerated cervix, and a fullness of both fornices. The uterus could not be palpated on account of the condition of the abdomen. No subjective or objective signs or symptoms of pregnancy could be elicited. A diagnosis of a ruptured ectopic pregnancy or corpus luteum cyst with intraperitoneal hemorrhage. Immediate operation was advised and carried out.

Operation was done at the Lutheran Memorial Hospital. Preoperative temperature 99° per rectum; pulse 140, weak and thready; respiration 28; blood pressure 104/76; red blood count 1,800,000 and hemoglobin (Tallqvist) 40-50.

At laparotomy the peritoneal cavity was found full of clotted and free blood. The right adnexa was exposed and a thickened tube and an enlarged ovary were found. The tube and ovary, and the blood clots were removed.

Pathologic report: Fallopian tube 8 cm. long; the mid-portion was 1.5 cm., dilated with free blood in the lumen. The ovary was 3 cm., across and contained a hemorrhagic corpus luteum cyst. No gross evidence of placental tissue or fetus. Microscopic findings: Section of the ovary showed a corpus luteum cyst with hemorrhage within. Section of the fallopian tube showed no evidence of decidual reaction or inflammation. No chorionic villi were found in the fallopian tube or ovary.

On gross examination of the ovary, the cavity was deep, and appeared to be lined with a thickened membrane with a rough surface which could easily be peeled off, which was considered to be probably the amnion and the chorion which resembled an ovarian pregnancy.

Transfusion was considered, but not having a suitable donor, the patient was given 2000 c.c. of normal saline solution subcutaneously by the syringe method and 500 c.c. in the peritoneal cavity. Patient made an uneventful recovery and left the hospital on the eleventh day.

55 EAST WASHINGTON STREET.

## Society Transactions

### AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS\*

#### FORTY-FOURTH ANNUAL MEETING

*White Sulphur Springs, Va., September 14, 15, 16, 1931*

DR. EDWARD SPEIDEL, LOUISVILLE, KY., read a paper on the **Reduction of Fetal Mortality**.

DR. PALMER FINDLEY, OMAHA, NEBRASKA, read a paper entitled **Maternal Mortality and Its Relation to the Teaching of Obstetrics**.†

DR. GEORGE W. KOSMAK, NEW YORK CITY, read a paper entitled **The Responsibility of the Medical Profession in the Mortality From Childbearing**. (See page 748, November, 1931, issue.)

#### DISCUSSION

PROFESSOR L. ADLER, VIENNA, AUSTRIA.—In Austria the hospitalization of the labor case is always urged, and we all try to get as many cases as possible, not only of pathologic labor, but also of normal labor, into our hospitals and institutions. But we do not close our eyes to the fact that hospitalization is not abolishing all of the trouble.

The Viennese school has always been very conservative about obstetrics. We try to avoid too great radicalism and therefore perhaps our results are better than those elsewhere. We are trying to teach our students more of what nature can do during confinement rather than what art can do, and by doing this I think we have been able to show good results.

DR. W. R. COOKE, GALVESTON, TEXAS.—There are several points which might be made in regard to cesarean section. The first is the education of the student, for it seems impossible to reach the man who has been in practice a long time. I suppose most of us teach symptomatology and prophylaxis but do not teach much about the obstetric conscience. If teachers would give special attention to the development of the obstetric conscience, we might make some headway with the coming generation of general practitioners.

The second deals with the education of the general public. Women have been told a great many things through the lay press and otherwise so that they now demand prenatal care and thus have made better practitioners of many men. On the other hand, they have gotten an exaggerated idea of analgesia and they come in feeling that they should make no efforts and feel no pain. The obstetrician is apt to weaken and give in to the desire since he thinks cesarean section is not a dangerous operation.

\*For lack of space in the JOURNAL, it has not been possible to publish all of the papers presented at this meeting. The discussions are likewise condensed. The complete proceedings may be found in the current volume of the Society's Transactions.

†Dr. Findley's paper was previously read in part at the White House Conference and has already appeared in abstract in the special issue of the JOURNAL published in June, 1931.

DR. KOSMAK (closing).—Dr. Cooke spoke correctly about the ease of operation and that is where we are making a great mistake. In performing an operation not only must one take into consideration the mere mechanics but the particular condition of that patient and whether she is a fit subject for cesarean operation. Stimulated by its technical simplicity some men are led into doing the operation, when they have not seen what goes before and do not realize what comes afterward.

As I said in my paper, it is unfair to compare the United States with the foreign countries because the conditions are so different. In Sweden in a series of over 3,000 deliveries at a large lying-in hospital there were just two cesarean sections in one year, one for placenta previa and the other for contracted pelvis. Why? Because the pelves of those women are large. Going to Edinburgh one will see many more cesarean sections because the Scottish pelves are not so large as the Swedish.

Answering Dr. Davis' question, I suppose he referred to what is considered a stillbirth. We are troubled with that same definition in New York. The New York Board of Health reports every infant death as a stillbirth if the products of conception are evident to the naked eye. The Academy of Medicine has attempted to change the situation but there are certain political and religious factors at work which prevent it. Of course, that does not enter into my statistics at all.

As regards the causes of death, our committee found a great many more cases in which the cause of death could be attributed to the delivery than to some other condition; in other words, a woman developing a pneumonia during the course of a puerperal sepsis was put down as dying of pneumonia when, as a matter of fact, she died of puerperal sepsis. Our committee has therefore added to the number of puerperal deaths rather than subtracted from it.

DR. A. J. SKEEL AND DR. FRANK F. JORDAN, CLEVELAND, O., read a paper entitled **A Consideration of Cesarean Section, With a Survey of 1047 Cases in the Cleveland Registration Area in Five Years.** (For original article, see page 172.)

#### DISCUSSION

DR. L. E. PHANEUF, BOSTON, MASS.—I have reported 418 cervical cesarean sections done by myself in thirty-four different hospitals. A large percentage of these operations were performed on women advanced in labor. I have looked up my last 238 cases, done with transverse cervical incisions. There were six maternal deaths or 2.5 per cent. The causes of death were septicemia in one, during an epidemic in Boston three years ago, in which several women died after perfectly normal labors. One death was due to lobar pneumonia, pulmonary embolism claimed two puerperal patients. One woman with a fibroid uterus died of acute cardiac dilatation. She had a mitral lesion which had caused considerable concern during her pregnancy. The sixth patient had a completely detached placenta and uterine apoplexy, a so-called Couvelaire uterus. She had total suppression of urine, having passed but one dram of urine during the twenty-four hours she lived after operation, and yet abdominal delivery offered her the only chance, slight though it was.

Unfortunately there will always be a mortality attached to cesarean section and I believe that the indication for which the operation is done is of paramount importance in determining this mortality. To illustrate, a woman with complete separation of the placenta has a better chance when delivered abdominally than she has when delivered through the pelvis, even though the mortality of cesarean section will be high in this group of cases.

I believe we could improve the statistics to a great extent by doing the low or cervical section in potentially infected women.

About twenty cases of placenta previa were delivered by the cervical operation. All the mothers recovered.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—I have the privilege of reporting figures gathered by Dr. Theodore Adams of Portland, Oregon, covering the years 1926 to 1929 inclusive. This survey covers the city of Portland and practically all of Multnomah County, Oregon. There were during that time 19,500 births reported with an incidence of 217 cesarean sections or a percentage of 1.12. One-half of these cesarean sections, to be exact 110, were done by trained obstetricians and 117 by general practitioners. The mortality rate was 4.6 per cent and the fetal mortality was 10.1 per cent. It might be interesting to note that in 14 cases of eclampsia 11 cesarean sections were done by general practitioners with a mortality of 3.

DR. JAMES K. QUIGLEY, ROCHESTER, N. Y.—Attention has been called rather recently to the high incidence of pulmonary embolism following cesarean section. I want to ask Dr. Skeel if he has noticed it in his survey?

DR. D. L. JACKSON, BOSTON, MASS.—A few years ago, when there was a great deal of adverse discussion about cesarean section, my colleague, Dr. Raymond S. Titus, and I became rather perturbed about the subject and took occasion to study a series of cases from our private records, with special reference to cesarean section.

Among 2539 consecutive obstetrical cases in private practice, the number of cesareans was 258, or 10 per cent. Of these, 171, or 66.6 per cent, were primary cesareans, while 87 or 33.3 per cent were repeat cases.

The indications for operation were as follows:

Previous cesarean	87 or 33.3%;
High presenting part or pelvic disproportion	57 or 22.1%;
Toxemia	26 or 10.7%;
Previous hard labor	15 or 5.8%;
Separated placenta	8 or 3.1%;
Cardiac disease	14 or 5.3%;
Extensive repairs	13 or 5.0%;
Placenta previa	8 or 3.1%;
Age	7 or 2.6%;
Complicating fibroids	5 or 1.5%;
Constitutional diseases	5 or 1.5%;
Nephritis	4 or 1.5%;
Sterilization	3 or 1.1%;
Eclampsia	3 or 1.1%;
Diabetes	2 or 0.7%;
Ruptured uterus	1 or 0.4%.

In the total series the mortality was 18 cases, or 0.7 per cent. In the noncesarean cases the causes of death were as follows: In three undelivered cases, two patients died of influenza and one of mitral stenosis. Of the delivered cases, two patients died from placenta previa, two from embolus, one from toxemia, one from nephritis, one from shock or hemorrhage, one following transfusion, where in spite of the fact that the bloods seemed to match satisfactorily, they did not coincide in the patient, and one from influenza.

In the cesarean group, six patients died, a mortality of 2.3 per cent. The causes of death here were: Two from general peritonitis, one from mitral stenosis, one from separated placenta, one from embolus and one from cerebral hemorrhage on the tenth day, patient never having shown any symptoms of toxemia. The cause of death was not determined until an autopsy showed a definite cerebral hemorrhage.

Notwithstanding the fact that this series is not large, it seems to show that with the operation in the hands of selected operators the results of cesarean section will not show greatly increased mortality over the death rate resulting from other abdominal operations of election.



DR. JAMES R. McCORD, ATLANTA, GA.—Atlanta has a population of 350,000, eighty thousand of whom are colored. This discussion is a summary of an unpublished study by Dr. Colvin of Atlanta. During the five-year period from 1925 to 1930 in seven hospitals in Atlanta there were done 220 abdominal sections. The mortality was 5.5 per cent. The incidence was 1 in 92 hospital deliveries. The classical section comprised 86.4 per cent of the total and the low cervical 9.5 per cent, the Porro 4.1 per cent. The mortality in the classicals was 5.8, in the low cervicals 4.8 and in the Porro, 0. The morbidity in the classical group was 41 per cent and in the low cervical 38 per cent. In 20,286 hospital deliveries the cesarean incidence was 1.8 per cent. In 91.8 per cent pregnancy had reached the eighth calendar month. There were 55.9 per cent of primiparous women and 59.6 per cent were not in labor; 30 per cent had been in labor less than twenty-five hours. The membranes were unruptured in 81.8 per cent. The main indications for the operation were as follows: Contracted pelvis, 26.2 per cent (8.1 per cent of these had a previous cesarean for the same indication), toxemia of pregnancy 20.2 per cent, placenta previa 15 per cent and dystocia 10.4 per cent. Sterilization was done in 23.1 per cent.

The causes of the twelve deaths were as follows: General peritonitis 8, metastatic complications 2, ether pneumonia 1, and pulmonary edema 1.

The total fetal mortality was 16.4 per cent. In placenta previa it was 21 per cent, in dystocia 8.7 per cent, eclampsia 35 per cent, in preeclampsia 27 per cent. Fifty-four per cent of all the fetal deaths were attributed to prematurity.

DR. SKEEL (closing).—We had in our clinic 154 sections with 3 deaths, or about 2 per cent, during this period and we think our cervical section was responsible for the low mortality.

The purpose of this paper was twofold, first to show the desirability of cervical section; second to show that, because of the improved technic of cesarean section, the indications have widened to include a number of conditions from which women die no matter what you do for them; and that although the number of cesarean deaths is increased, because we are operating for dangerous pathology, the only way we can say whether the cesarean is desirable is to compare the results with the results of other treatments for those conditions. We are trying to show the comparisons in that way.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA., read a paper entitled **Submucous Perineoplasty**. (This paper is published in the current volume of the Society's Transactions.)

DR. RALEIGH R. HUGGINS, PITTSBURGH, PA., read a paper entitled **What Is Conservatism in the Treatment of Neisserian Infection?** (See page 187.)

#### DISCUSSION

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—I can bear out what Dr. Huggins said regarding the relative safety of operating in the acute stage of gonorrheal salpingitis. Sometimes with apologies afterward, we operate upon these patients because we or others insist that they have appendicitis. Years ago I removed the purulent tubes and the patients did well. Later we closed the abdomen, but did a vaginal drainage without removing the tubes, and none of the patients had postoperative complications. Other cases we have simply opened, stripped the tube to obtain pus for examination and culture, and if no evidence of anything but the gonococcus was found, the wound was sewed up without any drain-

age. Despite contact with the pus, the abdominal wound healed without reaction and the patients were able to leave the hospital in eight or ten days. If vaginal drainage was done, they would go home in about two weeks and I do not recall any of these patients with an acute gonorrheal salpingitis with open tubes who later came back with pelvic complications.

The question has arisen whether we did not benefit these patients by what seemed at times an unnecessary operation. Of course, the small fallopian tubes from which the pus is escaping cannot usually be palpated through the vagina; and it is not surprising that a proportion of such patients is transferred from the gynecologic to the surgical service with a diagnosis of appendicitis. In such a case, in removing the appendix the tubal infection did not at least undergo exacerbation.

DR. HENRY SCHMITZ, CHICAGO.—Gonorrheal infection is essentially a self-limited process. If absolute rest for the genital organs is maintained, about 60 per cent of the cases will recover anatomically. Reinfections are due to two factors; the foci of infection in the cervix and the vulva have not been removed; or the pelvic organs have not been kept at rest, the patients resuming marital relations too early. Thus about 15 to 20 out of 100 cases become chronic invalids. They require some sort of an operation to remove the residues of the former acute infection.

It would seem to be a too radical precedent to operate on acutely inflamed tubes either of a primary infection or an exacerbation. I will admit that patients do recover after operation for acute appendicitis but that fact does not justify a similar management in pelvic infections. The highest ideal of the surgeon should be to save as much of the pelvic organs as can be done. Finally if only menstrual difficulties remain as prolonged, profuse or painful menstruation, then temporary sterilization with x-rays may relieve the patient. I believe that we should be particularly conservative in the treatment of pelvic infections in women.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—Patients may recover if operated upon during the acute stage, but there is some mortality attached to operation at that time. It is also true that almost every case of pus tubes, gonorrheal infection, can be counted upon to be got into a quiescent condition. I have not found that so, however, with appendicitis. If we choose to operate upon a patient with Neisserian infection during the acute stage it may mean taking out both tubes and the ovaries, but if we wait for a quiescent stage we may remove the tubes and leave the ovaries, or at least one ovary, and the patient's future life will be normal.

If we operate during an acute stage of appendicitis, the source of the infection is being removed, but if we remove an acute pus tube, we take away only a part of the source of infection and the infection may go on in another part. In operating upon acute appendicitis we go down directly over the appendix and remove it without disturbing the peritoneum or distributing the infection, but if we go through the Neisserian infection field we may distribute it through the whole abdomen.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—I have examined about five thousand oviducts and in many instances where the infection was gonorrheal I could see no justification for the operation, and in the cases where operation had been done during the acute stage there was opportunity of following some of them to the autopsy room. I agree that it is very dangerous as a rule to operate upon these cases in the acute stage.

The ordinary experience is that the oviduct when infected by the gonococci will seal itself very quickly in the distal and proximal ends, and the contents within the tube will become sterile within a period of twelve or fifteen days where the walling off is effectually accomplished.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—One of the sequelae of this infection about which little is known is the small mild type of hydrosalpinx. In my studies of sterility, using hysterosalpingography as a method of determining the site of the tubal obstruction, many cases of small hydrosalpinx not found on bimanual examination were unsuspected because the patient gave no history suggestive of a former gonorrheal infection. The hysterosalpingogram, however, showed the distal ends of the tubes as small sacs of iodized oil hanging down in the pelvis. In the twenty-four-hour film when the uterus and the proximal ends of the tubes had evacuated themselves of the iodized oil, there still remained these sacs of oil, visible evidence of small hydrosalpinges. These hydrosalpinges are on the average from 2 to 4 cm. in diameter and very thin walled, the wall contains scarcely any muscle and hence, has no contractile power and cannot empty itself and for this reason is still seen in the twenty-four-hour film. These hydrosalpinges are often seen at operation but are not often diagnosed before operation because they are so soft as not to be felt even under anesthesia.

DR. W. R. COOKE, GALVESTON, TEXAS.—Dr. Huggins is convinced that it is safe to operate on the acute tube. Dr. Barrett mentioned the fact that we have many sequelae by removing the tubes early, but Dr. Barrett did not mention the primary operative mortality. My own experience in that line may be worth something in a small way. Some years ago I had an idea that one could operate on acute tubes as safely as on the cooled off tube and in 500 laparotomies I had a mortality of 3 per cent, or 15 deaths. In 1924 I became more or less disturbed and began to operate only on the "cooled off" cases. The result was that during the last 3900 laparotomies we have had only 7 deaths from peritonitis. I am speaking solely of peritonitis deaths as proved by autopsies. Those 7 deaths out of 3900 cases were patients operated upon in violation of the rule of waiting until the pelvis was thoroughly cooled.

I should like to see the figures in support of the claim that we can operate in the acute stage with as low mortality as by waiting.

DR. HUGGINS (closing).—This discussion ended just about as I expected it to end. I tried to make it clear in the beginning of my paper that many of these patients get well without any operation at all; that we did not operate in the acute stage ordinarily, and that we certainly never operate unless the patient has had several attacks of this form of infection. It is the case that has gone on from three to five years with positive symptoms and recurring attacks that we referred to, and not a single individual who discussed the paper made mention of the effects of this infection or at least of its destructive effects on the ovarian tissue.

A case was recently seen in a young girl, twenty-three years of age, who came into the hospital with a third attack of salpingitis. Operation was delayed until the leucocyte count, and the sedimentation time were normal, and there was no elevation of temperature. At operation, one ovary was found to be completely destroyed by an ovarian abscess. Should the other tube, which was mildly diseased, be left with the risk that the other ovary become destroyed in a girl of twenty-three years of age? This result may be speculative, but it does happen, and these are the cases that come in our practice which give us great concern. There is no doubt about the wisdom of the conservative side of gynecology, but

some of these conditions are pertinent facts and cannot be destroyed simply by argument. So far as operation in the acute stage is concerned, it is our belief that when a woman comes to the hospital within the first twenty-four hours of an attack, which follows a number of previous ones, and especially after she reaches the age of forty, when the resistance is low, the danger of immediate operation is perhaps no greater than permitting her to go on with the infection as the course under these circumstances is very severe and not without serious risk. I called attention to the increased danger, so far as operation is concerned, that comes with each succeeding day, after the onset, when the infection is spreading through the lymphatics and over the peritoneum.

DR. M. PIERCE RUCKER, RICHMOND, VA., read a paper entitled **The Late Sequelae of Eclampsia**. (See page 211.)

#### DISCUSSION

DR. JAMES R. MILLER, HARTFORD, CONN.—In a paper read before the Connecticut State Society in May, 1931, Dr. H. M. Stander reported a five-year follow-up on toxemia of pregnancy in which there had been demonstrable renal damage. He showed that at the end of five years after the patient's first admission with renal damage 40 per cent of the patients had died. In this connection I would like to ask Dr. Rucker whether the eclampsia patients referred to includes both cases with and without demonstrable renal damage?

DR. W. T. McCONNELL, LOUISVILLE, KY.—I would also like to know upon what Dr. Rucker made his differentiation between cases of eclampsia and those complicated by preexisting renal damage.

One way of dividing these toxemias of late pregnancy is into primary and secondary. What I choose to call "primary" is one that does not depend upon any preexisting pathology. A secondary toxemia is one in which there is some predisposing pathology. Patients with a predisposing pathologic condition would show a much higher incidence of toxemia.

I feel sure that a patient whose toxemia is primary has very little chance of recurrence and I think, too, that a patient who has a toxemia, even though it is of a primary nature, which lasts a long time will suffer tissue changes which may predispose that patient to recurrence, whereas a patient who has an acute toxemia which causes perhaps visual disturbance, albumin in the urine, etc., if that duration is short and the conditions quickly subside, the patient will probably have no more recurrence than if she had never had any toxemia.

DR. RUCKER (closing).—By eclampsia in this paper I have meant simply late toxemias of pregnancy complicated by convulsive seizures. I have not attempted to differentiate between the types. For one reason, I did not feel capable of doing so and for the other reason they do not stay differentiated. The first in my clinic series, with many abortions, is a case in point. I think I would have decided for three or four years that it was a typical case of liver toxemia. This was an unmarried girl who was confined by a midwife. She went into convulsions after a six months' abortion. She afterward married and had three living babies, without any signs of toxemia, and then had a series of abortions. These abortions were accompanied by high blood pressure, toxemia and albuminuria, and finally she died of typical cardiorenal disease with a big heart, a big liver, and a big bleeding uterus. So I was at a loss to know exactly how to classify these patients. For that reason I have taken eclampsia to mean simply late toxemias of pregnancy accompanied by convulsions.

DR. SAMUEL D. SOULE, ST. LOUIS, MO., read a paper entitled **A Study of Thyroid Activity in Normal Pregnancy.** (See page 165.)

#### DISCUSSION

DR. A. K. PAINE, BOSTON, MASS.—It is particularly interesting to clinicians to know whether the physiologic increase in thyroid activity during pregnancy predisposes to, or increases the possibility of, true thyroid disease requiring medical or surgical treatment. The impression I have gathered is that this physiologic increase during pregnancy is of no great clinical significance. I would like to ask the authors of the paper whether, as a result of their work, they have any information to advance along this line.

DR. G. D. ROYSTON, ST. LOUIS, MO.—This interesting paper brings out the frequency of hypothyroidism during pregnancy. Geographical distribution of thyroid reaction is important and, according to Maccomber, the supply of iodine in the food and water steadily diminishes in localities more than fifty miles distant from the sea. Certainly in St. Louis we have a great many minus metabolic readings.

Drabkin in St. Louis has recently brought out the frequency with which minus basal metabolic readings occurred in his series when doing daily metabolic determinations during the last two weeks of normal pregnancy. Another interesting feature of this work was the marked variations that sometimes occurred from day to day in the same individual. His work was checked with the apparatus used on the internal medical service and the metabolism service, with identical results.

It is our custom to do routine basal metabolic determinations on all private pregnancy patients. In looking over the last 300 consecutive private pregnancy records 61.33 per cent showed minus readings; 5 per cent showed a zero reading; 33.66 per cent showed a plus reading. The readings were as follows: 5 per cent were 0 per cent, 21 per cent showed minus 1 per cent to minus 5 per cent, whereas 17 per cent showed plus 1 per cent to plus 5 per cent. Fourteen per cent showed minus 6 per cent to minus 10 per cent readings, while 12 per cent showed plus 6 per cent to plus 10 per cent readings. Seventeen per cent showed minus 11 per cent to minus 15 per cent, and 4 per cent showed plus 11 per cent to plus 15 per cent readings. Five per cent showed minus 16 per cent to minus 20 per cent, whereas 2 per cent showed plus 16 per cent to plus 20 per cent. Only one-third of 1 per cent showed minus 20 per cent to minus 25 per cent, whereas 2 per cent showed plus 20 per cent to plus 25 per cent readings during pregnancy. My associate, O. S. Krebs, will make a clinical analysis of our results in a later publication. These readings were done during the first and second trimesters and at term, and a fourth determination was done at the end of the puerperium.

Minus readings ordinarily became lower, while plus readings became slightly higher with advancing pregnancy, although the rise was to a lesser extent than the fall in the basal rate among the negatives. There was a tendency for the underweight patient to gain and the overweight patient to reduce in weight during the administration of thyroid, yet in some instances the minus basal readings often dropped in spite of thyroid therapy.

Among the patients with hypofunction, lassitude and nervous depression were frequent accompaniments, while a tendency to toxemic symptoms, abortion and postmaturity, followed by subinvolution was not uncommon. Menstrual disturbances, menorrhagia (though more frequently periodic amenorrhea), oligo-amenorrhea and sterility were often noted. It was surprising how often subinvolution seemed to be associated with thyroid disturbances. Certainly in the St. Louis area hypothyroidism during pregnancy is a matter of frequent occurrence and is commonly overlooked.



DR. SOULE (closing).—In reply to Dr. Paine's question, we have made no particular attempt to correlate this experimental work with any clinical findings and offer it purely as scientific evidence of an increased amount of thyroid hormone during pregnancy.

DR. E. MACD. STANTON, SCHENECTADY, N. Y., read a paper entitled **Stoneless Gall Bladder; a Study of Operative Cases.** (This paper is published in the current volume of the Society's Transactions.)

DR. JAMES F. BALDWIN, COLUMBUS, O., read a paper entitled **The Treatment of Pus Tubes.** (See page 207.)

#### DISCUSSION

PROFESSOR L. ADLER, VIENNA, AUSTRIA.—I think Dr. Baldwin has omitted mention of the vaginal incision probably on purpose because, as is our custom in Vienna, we do vaginal drainage of pus tubes not as a routine but only as a matter of necessity: If the temperature rises, the pains are unbearable and the danger of general peritonitis or rupture is imminent. We are conservative and vaginal incision is more radical than if you wait a long time and then do whatever later operation may be necessary.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—I have seldom found it desirable, and can hardly appreciate the taking out of pus tubes and failing to cover their raw surfaces. There is scarcely any condition more likely to become infected at the point of suture, and the peritoneum furnishes an opportunity for covering the raw surfaces with the greatest facility.

As to retaining menstruation, I believe if we could save childbearing patients this function when we operate, we should do so, but in pus tubes that is almost out of the question. I believe most patients would prefer to have a genital senility postponed for ten years rather than shortened by ten years.

Regarding the fixation of the sigmoid to the pelvic brim, I believe the less fixation that is done the better off the patient is. The worst that can happen to an uncovered surface is that the sigmoid or the cecum or the bladder might become adherent to it.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—Dr. Baldwin's method of suturing the cecum and sigmoid across the brim of the pelvis to cover over extensive denuded areas is not necessary in most pus-tube cases; in fact, I prefer to mobilize them if they are involved in adhesions. The procedure, however, is of great value if the bladder, ureter or rectum has been so injured that there is danger of a fistula developing, or in the presence of an unusually virulent infection. It is quite possible to create a dam between the pelvic and abdominal cavities by the technic he describes and vaginal drainage will then take care of any possible leakage or infection. If a panhysterectomy has been performed the same end may be easily secured by suturing the very movable vesical reflection which has been dissected off the front of the uterus, to the anterior surface of the sigmoid and cecum.

As to the importance of maintaining the menstrual function, my experience has been that if the true facts of the case are explained to the patient she will be very glad to be rid of menstruation. Whenever possible it is advisable to retain an ovary even if the uterus has been removed so that the possibility of senile changes may be lessened and that the immediate convalescence will not be complicated by the flushes and other nervous manifestations of the menopause. By preserving an ovary one may at least assure the patient that she will not, as she fears,

become old, fat or gross. To allow menstruation to continue when there is no possibility of pregnancy seems unnecessary and most women will welcome the freedom from menstruation provided they clearly understand the situation.

DR. A. K. PAINE, BOSTON, MASS.—Repeated attacks of pelvic inflammation have been mentioned here a number of times as an important factor in the decision to operate on these cases. The observation of some 500 cases of gonorrhea in women in the Boston Dispensary over a period of fourteen years has demonstrated that these repeated attacks bear a very definite relation to a continuation of the infection.

When there are repeated attacks of pelvic inflammation one should not first consider what variety of surgical treatment is to be employed; he should first find out if he is not dealing with an uncured gonorrhea the cure of which may result in a cessation of these repeated attacks of pelvic inflammation. It was interesting in the above series to note that the most troublesome recurrent pelvic inflammatory reactions were sociologically grouped as occurring in married women, where obviously the element of continuing infection or reinfection is most common.

Regarding the surgical management of these cases, our experience has led to the formulation of some rather definite rules of procedure: no abdominal operation in the first year; if a given acute attack does not clear up in ten days, the case is drained vaginally. Less than one-half of one per cent of these drained cases have required subsequent operation. Pregnancy subsequent to vaginal drainage is not uncommon. Abdominal operation is reserved for the late case, with the pathology of postinflammatory degeneration and the so-called secondary neurological symptom complex these patients so frequently describe.

DR. S. E. TRACY, PHILADELPHIA, PA.—Any structure in the pelvis which is healthy, or which will recover, should be conserved. Suspension of an ovary after a conservative operation is most important. To allow such an ovary to drop down in the pelvis is almost certain to cause future trouble. Dr. Baldwin's technic for the disposition of an infected, traumatized or oozing pelvis is admirable. We have been using a similar technic for several years. Instead of packing gauze into the vagina and pelvis, rubber tissue is used which does not dam back the fluid and which upon removal causes the patient decidedly less pain and discomfort. The sigmoid when placed over the rubber tissue closes the pelvis.

In patients on whom a hysterectomy has been necessary, the bladder peritoneum is sutured to the infundibulo-pelvic ligaments at the side of the pelvis. The sigmoid is dropped down and the bladder peritoneum is attached to one or two epiploic appendages and in a few hours the pelvis becomes an extraperitoneal cavity.

DR. S. J. GOODMAN, COLUMBUS, OHIO.—Before we take the statistics offered by Dr. Barrett too seriously I think we should know whether the different men had the same type of cases. One man may have run into a group of very serious cases and the other not. Furthermore, the man who lost no cases in a large series may have been a very competent surgeon, whereas the man who lost six cases may not have been such a good surgeon.

DR. HENRY SCHMITZ, CHICAGO, ILL.—In the treatment of these chronic pus tubes one should remember that the more conservative the treatment is, compatible with the conditions found, the better off our patients will be. It makes a great deal of difference whether the menstrual function is retained or not. A patient who is young and who has ceased menstruating is as a rule unhappy. And it is only exceptionally that a woman feels very happy when she has been relieved of her sexual functions. However an exception does not prove a rule, and a rule does not prove an exception.

DR. BALDWIN (closing).—My patients are all private patients; many of them are poor, but they are my private patients just the same, and I study each case individually, see the patient twice a day until she leaves the hospital, and take very thorough histories. I know that when such patients, after a hysterectomy, report for any reason, they all seem very glad that there is no longer any menstruation.

My intent in operating on these cases is to save everything that may be of benefit to my patient and that will do no harm; therefore, I object to leaving the cervix. I note that Dr. Charles Mayo has recently come out in warm approval of the routine removal of the cervix in cases of hysterectomy, and I notice also that a number of foreign surgeons are advising the same procedure, thus not only obviating the danger of cancer, but also of leucorrhea, dyspareunia, etc.

In the many cases in which vaginal drainage is indicated, the sigmoid can be easily swung around over a gauze fluff and attached to the peritoneum at the brim of the pelvis. I described in full my technic in a paper which I read before this Association many years ago, by which I save much of the peritoneum from the anterior surface of the uterus so that its attachment to the sigmoid does not displace the bladder and is made with no tension at the point of union. At the clinical meeting of this Association at Columbus, some years ago, I presented what had been one of the worst cases of puerperal infection I had ever operated upon. The patient was young. I put in the gauze fluff as advised, was able to save one ovary, swung the sigmoid around, and she made a perfect recovery.

I always save an ovary in women under forty if the ovary is healthy. In one case I was able to save only a little piece of an ovary, about the size of a pea, but the woman recovered and later was delivered of twins. In cases in which the ovaries are the seat of abscesses they cannot, of course, be saved. In one case, in which I had been obliged to remove both ovaries in a young woman, I later, because of her complaining of loss of libido, transplanted an ovary, and with apparently perfect results. If the ovaries are saved, in cases in which the sigmoid is used, the ovary should be brought up above the sigmoid so that it will not be imbedded in adhesions.

Recently I was asked to see a patient, aged thirty-four, a widow for two and a half years, with three children. She had developed an acute pelvic condition of 48 hours' standing. During her fourth pregnancy she had had an abortion induced, and the resulting infection had left her a chronic invalid, practically everything in the pelvis being in a conglomerate tender mass. This condition had been present for three years, but within 48 hours there had developed an acute condition and the question was whether we were dealing with an appendicitis or a lighting up of the tubal involvement. Examination showed the pelvis filled with the old mass, which was tender throughout, but immediately back of the cervix was an exceedingly tender spot, which with the acuteness of the symptoms I was inclined to look upon as the appendix and hence advised an immediate operation. At operation the appendix was found extending down to the bottom of the culdesac; was gangrenous, had perforated, and was in a little pocket of pus. Everything was dug out and removed, but one ovary was saved, a gauze fluff used with mobilization of the sigmoid, and a perfect recovery ensued not only of the appendicitis but also of the pelvic conditions.

I have removed about 6000 uteri and in cases such as I have described the safest procedure is to remove all the diseased structures but save an ovary or ovaries in young women, but with particular care to peritonealize the entire surface and carefully smooth out the omentum as it is brought down to cover the field of operation.

PROFESSOR L. ADLER, VIENNA, AUSTRIA, gave **The Fourth Joseph Price Foundation Lecture: The Treatment of Carcinoma of the Cervix by Vaginal Hysterectomy and Radium.** (To be published in a subsequent issue of the JOURNAL.)

DR. ARTHUR H. BILL, CLEVELAND, OHIO, gave the **President's Address: The Newer Obstetrics.** (See page 155.)

DR. JAMES E. DAVIS, ANN ARBOR, MICH., read a paper entitled **A Critical Study of Twelve Hundred Cervices.** Published in the current volume of the Society's Transactions.)

DR. STEPHEN E. TRACY, PHILADELPHIA, PA., read a paper entitled **Carcinoma of the Uterus Complicated by Tubal Gestation.** (See page 223.)

#### DISCUSSION

DR. ERWIN VON GRAFF, IOWA CITY, IA.—In my material of cancer of the cervix operated upon by the Wertheim method, in the first 1000 cases there was found one case of tubal pregnancy as an accidental finding. The patient had no symptoms or they were overlooked. She had a persistent bloody discharge. The second patient was one upon whom I had operated myself. It was again an accidental finding. There was a tremendously large cauliflower tumor, and also an undisturbed ectopic pregnancy. The most astonishing thing about this case was that the pregnancy was not more advanced than six weeks and yet there was a large cancer present. Conception must have taken place in spite of an already developed cancer.

DR. HENRY SCHMITZ, CHICAGO, ILL.—It is natural that the cases of tubal pregnancy associated with carcinoma are rare. I wish to report a recent case. The patient was a primipara, twenty-five years of age, who was near full term. She entered the hospital because of very profuse discharge with a bad odor, not thinking that anything might be seriously wrong. She had a cauliflower growth, well advanced. The difficulty which arose was solved as follows: An extraperitoneal low cesarean section was recommended. As soon as the patient recovered from this operation the cervix was treated with radium and eventually the woman recovered; that is, she was entirely free from carcinoma.

If in the presence of such an extremely advanced carcinoma of the cervix a Porro operation had been done, the patient would have succumbed to septic peritonitis.

Strange to say, this patient had a sister who became pregnant when she was twenty-four years of age and died from carcinoma of the cervix before the pregnancy was completed.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—I have in my collection two cases of carcinoma of the oviduct, one extending from fundal carcinoma, and the other occurring coincidentally with carcinoma of the cervix. There is no reason why cancer cannot be multicentered in these organs.

DR. TRACY (closing).—A patient was referred to me because of metrorrhagia. At examination the question of pregnancy arose, but a positive diagnosis could not be made. The patient had a cervix which was lacerated and ulcerated and bled on the slightest manipulation. It was finally decided that the patient was also pregnant. A biopsy was made and the pathologist reported a carcinoma of the cervix uteri. The patient was at this time about four months pregnant.

The following week at a hospital conference, another pathologist denied any microscopic evidence of malignancy. He stated that there is a peculiar cell arrangement in the cervix during pregnancy and unless one has encountered it frequently he is likely to make a mistake in the diagnosis. A second pathologist concurred in this opinion. The patient had a miscarriage two weeks later and after she had recovered the laceration was repaired. The entire tissue secured at operation was examined histologically and no malignancy was found. Such a condition as this should be borne in mind as radical treatment in a young woman would be most unfortunate.

DR. CHANNING W. BARRETT, CHICAGO, ILL., read a paper entitled **Diverticulosis and Diverticulitis**. (Published in the current volume of the Society's Transactions.)

DR. PAUL TITUS AND DR. J. R. EISAMAN, PITTSBURGH, PA., read a paper entitled **Eight Months' Extrauterine Pregnancy, Calcified, and Retained for Forty Years**. (See page 217.)

#### DISCUSSION

DR. EDWARD L. CORNELL, CHICAGO, ILL.—I have never seen a similar case in the history of the Chicago Lying-In or the Cook County Hospitals.

Masson and Simon in 1928 reported 9 cases from the Mayo Clinic and 174 in the literature. They stated that Schuman showed an incidence of 1.5 per cent in all cases of ectopic pregnancy. The incidence at Mayo's was 2 per cent. These percentages cannot represent the incidence in the United States else we should all see many more cases.

Abdominal and tuboabdominal pregnancy is not rare as the literature, especially in the past five years, is filled with reports. These cases are being recognized now especially since our diagnostic measures are becoming more refined.

DR. D. L. JACKSON, BOSTON, MASS.—I know of several cases of lithopedion. The first was in a woman of twenty-nine who had had two previous pregnancies. Five years ago the patient had no periods for six months. Subsequent to an automobile accident she was in the hospital for two weeks and was told at that time that she was not pregnant. One year after the accident she had severe pain in the lower abdomen with cramps and diarrhea. After treatment by her physician she improved for a time but later had an attack of diarrhea every six months. X-ray pictures confirmed the diagnosis of lithopedion.

In the second case, three years previous to the removal of the lithopedion, the patient was operated upon for extrauterine pregnancy, but her condition was such at the time that the tube was quickly tied off to control bleeding and the abdomen closed. At the end of three years the patient, having had a miscarriage in the interval, complained of a pain in the right upper abdomen. A mass was found in the region of the gallbladder. An exploratory operation was performed and a lithopedion was found adherent to the gallbladder and duodenum. It was fixed by numerous capillaries which caused considerable bleeding at the time of removal.

The third patient had an apparent pregnancy thirty years previously which never terminated, and the reason was not investigated in any way, as the patient lived in a remote district where medical attention was difficult. Subsequently the patient was seen and operated upon for an abdominal tumor which turned out to be a lithopedion.

I would like to ask in regard to the deposit of calcium in these cases after the cessation of growth of the fetus. In the slides shown there seems to be more bony



structure laid down than one would normally expect to find in fetuses of a stage of development corresponding to the duration of time as given by the history in these cases.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—A case was recently encountered showing that calcification is not necessarily present although the term lithopedion is generally employed for this condition. A colored woman had had a large, hard tumor in the midline of the lower abdomen for about ten years. There was no suspicion, either from the history or the examination, that it was tubal pregnancy and it was diagnosed as a fibroid. The pelvic organs were so densely adherent that at first it was almost impossible to identify them. The main tumor proved to be cystic and during its enucleation the wall was torn allowing the escape of some fluid which suggested that it was an ovarian dermoid. It proved however to be the sac of an old tubal pregnancy and in the bottom of this were found all the bones completely disarticulated and with not a fragment of the soft tissues adhering to them. The fetus had reached a development of about six months.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—We operated some years ago upon a colored woman for a fibroid tumor about the size of a seven months' pregnancy. There was no history of a pregnancy at the time. When we had removed the large fibroid a sac was found posterior to it. Upon tracing the sac to its pedicle we found that it went down to the right tube and in the sac contained a rather oily fluid. The sac was flaccid and contained a perfect disintegrated skeleton. There was not the least evidence of muscular tissue, no calcification, and even the three little bones of the ears were apparent and hair was found in two places.

DR. F. H. FALLS, CHICAGO, ILL.—Some years ago I endeavored to produce experimental abdominal pregnancy in dogs. I did a cesarean section and put one pup in the abdomen leaving the placenta in situ. I found that dogs almost invariably aborted and the pup in the abdomen died. Almost all of the pup was absorbed, including some of the bones. Apparently in the peritoneal cavity of the dog there was absorption of the bone calcium instead of deposition of calcium.

DR. P. BROOKE BLAND, PHILADELPHIA, PA.—Some years ago I reported a similar case. The patient, regarding herself as normally pregnant in due time—between the eighth and ninth month, experienced the usual false labor, as I imagine all these patients do, and subsequently she carried a calcified fetus for a period of thirteen years. During that time she gave birth to two normal babies at full term.

DR. JOHN W. KEEFE, PROVIDENCE, R. I., read a paper entitled **Volvulus of Large and Small Intestine**. (Published in the current volume of the Society's Transactions.)

DR. EDWIN P. SLOAN, BLOOMINGTON, ILL., read a paper entitled **Abdominal Incisions**. (See page 226.)

#### DISCUSSION

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—This is a very ingenious incision and is the most original method of closure of the abdominal wall that has been developed in the last twenty years. With contracted abdominal muscles, we have all experienced the difficulty in closing an incision in the upper abdomen, especially if gas oxygen, local or even ether anesthesia is used. It is difficult to produce accurate approximation of the peritoneum and of the under layer of the sheath of the rectus muscle with rigid muscles; and it is not surprising that Dr. Sloan has found that the results of closure under these conditions is often imper-

fect. Where large incisions are necessary for very extensive work in the abdomen, this operation is to be considered. Of course with the relaxing anesthetics, as Dr. Sloan has mentioned, the need for the larger incision is not as great; and if spinal anesthesia lasts long enough, it is relatively easy to operate satisfactorily through a comparatively short vertical incision with satisfactory closure of the muscles and fascia.

We also have to consider in relation to the anesthetic used whether during an operation a large opening is going to hamper us or not. Very often in using local anesthesia it is desirable to have sufficient bridge or covering for the upper abdominal contents, so that they will not be extruded by the straining of the patient; therefore, the incision should be planned so that the viscera not operated upon will be held in. The high transverse incision in such cases is often very helpful.

DR. WILLIAM E. DARNELL, ATLANTIC CITY, N. J.—Dr. Sloan pictures only the upper incision. He refers to the fact that always under the peritoneum there are adhesions with almost every abdominal incision, which is quite true. The point I want to make refers to the lower rather than the upper abdomen, where the tension is not so great. For many years, instead of whipping over the peritoneum layer to layer, we imitate the Connell intestinal suture. In our experience this is productive of very much fewer adhesions underneath the peritoneum than with the other method of suture because there is no raw surface underneath. No doubt the sutures have some part to play in the irritation which causes adhesions.

DR. SLOAN (closing).—It is true that with any muscle-splitting incision there is little or no exposure without retraction but in the incision described retraction of the flaps upward and downward provides a wide exposure. One advantage of all muscle-splitting incisions is that they can be easily closed without complete relaxation. With general anesthesia relaxation is lost before sensation returns. It is very difficult to close a vertical incision with a patient in this stage of anesthesia. The incisions described can be easily closed under such conditions.

DR. ERWIN VON GRAFF, IOWA CITY, IOWA, read a paper entitled  
**Abdominal Total Hysterectomy.** (See page 195.)

#### DISCUSSION

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—With every word of this paper I heartily agree. When performing a hysterectomy, I practically always remove the entire uterus, rarely doing the supravaginal operation. In one of Dr. von Graff's statistical tables the results from our clinic are quoted. These show a lower mortality for panhysterectomy than for the supravaginal procedure. Panhysterectomy is generally regarded as a much more difficult procedure than the supravaginal but we do not feel that it need be, and in simple, uncomplicated cases we have been able to perform it, including the abdominal closure, in twenty minutes. I simply state this to show what a simple procedure it may be and my assistants soon learn to carry it out with facility and rapidity. We feel that our results with the complete operation are a great deal better than if the whole or part of a crippled uterus is conserved and the danger of subsequent cancer development in the cervix is avoided. Most of our cases are complicated by the existence of infection, tumor formation or more or less extensive birth traumata and in a large proportion of them a preliminary perineorrhaphy has to be performed. The more complicated the case the more apt are we to do a panhysterectomy.

DR. EDWARD J. ILL, NEWARK, N. J.—I have lived a long while in the profession and have seen the pendulum of enthusiasm swing from one extreme to the

other and settle at last to a normal quiet rhythm. I have become suspicious of extreme views. I consider that facts and figures are often misleading under changed conditions. I hold that the results of operation of such eminent men as have presented the subject under discussion are those of experts and of teachers of high standing. They are perfectly right when they urge the total removal of every uterus where there is severe disease of the cervix or the canal. Whenever there is an indication to do so for fibroids there is an increased death rate of one-half of one per cent. When one goes along with several hundred cases of supravaginal amputation without losing a patient, one-half of one per cent loss looks rather large to me. Let us remember that often enough a badly diseased cervix has already developed a cancer when a supravaginal operation was done. Out of about 1200 cases I have operated on, I have seen cancer develop once, seven years after supravaginal removal.

I feel that I can only rely on my own personal experience in forming a judgment, and not on that of my colleagues who work in the same institutions as myself. When one considers that a vast majority of patients that are operated on for fibroids have tumors which produce no symptoms, in other words where there is no real indication for operation, and who will never die from these tumors; and when we consider that 28.6 per cent of all women after thirty-five years of age have fibroids, there must be a tremendous death rate in a country like ours where every man operates and not only the masters. This death rate must be tremendously increased when abdominal operations are urged and performed by others than the masters. Let us remember that what we say here and publish in the journals of the country form the basis of action which many not qualified think they must upset.

My authority for saying that 28.6 per cent of all women after thirty-five years of age have fibroids is from a study of the autopsy records of the Massachusetts General Hospital and The Johns Hopkins Hospital. That would mean that there are 450,000 women in the State of New York with fibroids. Imagine total hysterectomies being done in all those cases, not only in the large hospitals, but in every village and small town. What would the death rate amount to?

Such teaching must go out with caution. Dr. Hoffman through the public press has already told us that we have five times as many deaths from appendicitis as Italy has, not because they have better surgeons or we fewer masters, but because anybody seems qualified to remove the appendix. Extreme views are apt to be erroneous and harmful.

DR. W. R. COOKE, GALVESTON, TEXAS.—There are three points that have to be taken into consideration in this particular problem. The first is the skill of the operator; the second, the pathologic condition with particular reference to the parametrium; and third, the patient herself. With the occasional pelvic operator we find that the mortality in total hysterectomy is at least one and a half times as great as against subtotal hysterectomy. We might say that with an average operator one thousand out of one hundred thousand women would lose their lives as a result of the routine adoption of complete hysterectomy, but with a skilled operator that is not true. A great many skilled operators will have a lower mortality for the complete than for the supravaginal operation. I think that is due to the fact that the appropriate cases can be selected by a competent gynecologist. I think the best rule for the occasional operator is to treat any cervical condition less than malignancy with the cautery. The incidence of death from cancer in the stump is certainly less than the actual 2 per cent mortality with the average operator. Again, you can cure some cases of cancer, but you cannot cure the cases of postoperative death. If a patient returns for examination and reports symptoms, the cervix can easily and safely be removed.

In the case of patients who will not return for observation of the cervix after supravaginal hysterectomy, there is of course a greater risk of the development of pathologic conditions in the cervical stump. Very often the best procedure in cases of this type is to perform a complete hysterectomy. Nevertheless, for the occasional operator to make use of this argument will lead to a great many unnecessary operative deaths.

DR. L. E. PHANEUF, BOSTON, MASS.—My own tendency has been in the last few years to do more and more total hysterectomies. I believe it is bad surgery to leave behind a badly lacerated cervix with ectropion, because of the danger of cervical carcinoma and also because of the accompanying posterior parametritis and backache which persist. I quite agree that in the hands of experienced operators the mortality of total hysterectomy should not be much greater than that of supravaginal. I do maintain that in the hands of the occasional operator the mortality of the total operation will be very much higher. Drainage, of course, is very much better instituted after the total operation than after supravaginal amputation. Personally I limit the subtotal amputation of the uterus largely to nulliparous women who have a healthy cervix upon whom I operate for fibroids of the uterus, and to the woman who has some constitutional condition which contraindicates the total ablation which is more extensive, takes longer to perform and which adds to the risk in the woman in poor physical condition.

DR. C. J. BONIFIELD, CINCINNATI, OHIO.—It seems to me that the statistics are not nearly of so much value as they appear to be on the surface, because each operator has his own reason for doing either a supravaginal or a complete hysterectomy. One of them does the supravaginal hysterectomy in easy cases, another does it for some other reason. No two operators are guided by exactly the same principles and it is very hard to compare their results. Any one who sees a great many people operate must realize that the danger is very much less in the supravaginal type of operation.

The pictures shown were of small uteri that anyone can easily remove, but when there is a large fibroid uterus, possibly involving one or both broad ligaments, and wide dissection is necessary, removal of the entire cervix is a very much more difficult operation than has been indicated by the discussants.

Dr. Phaneuf said he wanted to emphasize the fact that one should not leave the cervix if diseased. If a cervix is badly diseased, of course a total hysterectomy will be done, but in many comparatively healthy cervixes, and especially if the operator will hollow out the cervix well down toward the external os and leave it in a healthy condition, there will be no symptoms returning. At least, that has been my experience for a quarter of a century.

One speaker referred to fibroids coming after operation. His experience has certainly been different from mine and I would be inclined to think that those cases where he saw fibroids developing after the supravaginal hysterectomy had a little fibroid in the cervix at the time of operation and it simply continued to develop, having a very liberal blood supply. Personally I have never seen a fibroid develop in a cervix that was left behind.

DR. VON GRAFF (closing).—I want to say a few words concerning the technic. We purposely never fix a stump of the adnexa to the stump of the vagina, being afraid that some infection might involve the stump, and we are rather anxious to keep the stumps of the adnexa where they are and not bring them too close to the vagina. We also keep the vagina open; this affords the very best natural drain.

Dr. Weir mentioned one very important point. He said that his younger pupils are able to make a total hysterectomy without any difficulty or danger. That

raises the question whether one should decide to leave for the young operators the subtotal operation, as Dr. Cooke has suggested, reserving the total hysterectomy for the skilled operators. I feel that when a man is able to perform a subtotal operation only, the danger arises that he might sometime perform that operation in cases where total hysterectomy would have been advisable. I would rather suggest to teach the men who go in practice to do operative work, so far as they are capable to perform safely, a total hysterectomy, which would solve the problem satisfactorily for both patient and physician.

DR. PERCY W. TOOMBS, MEMPHIS, TENN., read a paper entitled  
**The Role of Focal Infections in the Etiology of Toxemia of Pregnancy.**  
(See page 199.)

#### DISCUSSION

DR. LESTER A. WILSON, CHARLESTON, S. C.—While there are conditions which point toward the infection theory, I am not convinced that the pregnancy toxemias are due to infection alone. Metabolic changes and endocrine disturbance both must be seriously considered. Further evidence of the infection theory are: the elevation of temperature in the newborn, jaundice of the newborn, the frequency of cholecystitis in toxic patients, and that we often find the blood pressure remaining high after delivery. I have recently treated two cases in which the symptoms of toxemia definitely subsided after the removal of infected teeth.

DR. R. T. LAVAKE, MINNEAPOLIS, MINN.—A summation of clinical and experimental data leads me to be more and more certain that infection frequently plays a most important rôle in the causation of true preeclamptic toxemia. To my mind it operates by increasing the load of the organs of elimination, by reducing the efficiency of these organs, and by producing placental necrosis. I believe Young to be correct in tracing the specific toxin in preeclamptic toxemia to placental necrosis. Though there is quite conclusive evidence that infection is only one of the possible causes of placental necrosis, of all suggested causes infection is the only one over which we can have any control and thus the practical value of this concept. As Dr. Toombs has intimated, this concept gives direction to our prenatal care. It directs the clearing up of foci of infection where possible, and in the presence of unavoidable infection it directs an increase in vigilance to detect the earliest sign of approaching toxemia.

If the placental necrosis theory of true preeclamptic toxemia is correct, we must explain the many cases in which massive necrosis gives no evidence of toxemia. In this regard increasing clinical and experimental data point to the likelihood that the presence or absence of this toxemia rests upon the presence or absence of toxicity in the placental cells, dependent upon their progenitor, the fertilized ovum. That fertilization can turn a nontoxic ovum into group of cells highly toxic to the mother is borne out by much clinical data. If nontoxic, massive necrosis may cause premature labor but will not cause true preeclamptic toxemia. If toxic, necrosis may cause premature labor and will cause toxemia, the degree of toxemia likely being dependent upon the extent of the necrosis, the toxicity of the ovular cells, the damage sustained by the vital organs of the mother, and the ability of her excretory organs to eliminate the toxin. That the toxin is not specific for all women is proved with reasonable certainty by the fact that the blood of toxemic women has been used for transfusions with no apparent harm to the recipients. I bring in this consideration of placental necrosis because I believe it is a link in the *modus operandi* of infection in the production of toxemia entirely apart from any adjuvant action of infection in the findings brought about by nephritis and the low reserve kidney. I consider Dr. Toombs' paper very timely,



because in most textbooks and clinics the rôle of infection in true preeclamptic toxemia is considered to have been so conclusively disproved that little or no attention is given to it, much to the possible detriment of prophylaxis and much to the loss of proper direction in presaging those cases in which, from my experience, preeclamptic toxemia is most likely to occur.

DR. PAUL TITUS, PITTSBURGH, PA.—I do not believe that focal infection plays any more of a rôle in these cases than merely acting as an occasional contributory cause of toxemia of pregnancy. The best proof we have of this is that many women who have profound toxemia of pregnancy have no evidence whatever of infection; the reverse also being true, that we see many women with focal infections in the teeth, tonsils and elsewhere who show no evidence of toxemia.

There is being brought to bear more and more proof almost daily that all toxemias of pregnancy are closely related to one another; that their underlying cause is a disturbance in metabolism. We have both metabolic and pathologic proof of these statements. For instance, the strongest argument probably that has been presented to bear out the idea that there is a dissociation between these states was the one that there are distinctive differences between the pathologic lesions in the liver in vomiting of pregnancy as contrasted with those of eclampsia. Nevertheless, various authorities and recently Acosta-Sisson have reported series of fatal eclamptic cases in which all types of lesions were to be found. Those lesions supposed to be typical of eclampsia were present in only a small portion of Acosta-Sisson's cases. We are likewise observing similar significant blood chemistry findings in the toxemias of late and of early pregnancy, with special evidence pointing to disturbances in carbohydrate metabolism.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—In cases of severe eclampsia where patients die and one has the complex pathologic picture of multiple hemorrhages or multiple necroses in the liver, in the kidney, in the myocardium, and around the ventricles of the brain, and the blood cultures show no infection, examinations for foci are without success, temperature remains normal, and the leucocytes are normal, toxemia must surely prevail. In other cases that recover you may find no rise of temperature, negative blood cultures, no rise in leucocytes and no signs of infection, but the next pregnancy shows a progressive nephritic pathology and an eclamptic condition. A number of these cases must be explained as occurring without infection.

DR. DAVID HADDEN, OAKLAND, CALIFORNIA.—When I started the practice of obstetrics I insisted upon each patient taking lime daily in some form for I believed that such a régime would save the teeth. A few years later I came upon an article written by a Frenchman who advanced the thought that the toxemias of pregnancy and eclampsia occurred because of a deficiency of lime. These two theories made me insistent that each patient take at least two tablespoonsful of limewater daily throughout the whole pregnancy. Under this régime I have seen albumin clear up in those patients who came to me in the later months of pregnancy. I have wondered if it was just a coincidence or if the lime had any significance.

I should like to see some of the members of this Association test out the adrenal cortex extract in eclampsia. Its use in exophthalmic goiter and in Parkinson's disease has given me some interesting results though its use in malignancy has shown only relief from pain. It without doubt produces a rapid elimination of muscle toxins.

DR. TOOMBS (closing).—It was not my purpose to convey the impression that it is my belief that all toxemias are due solely to infection, but to arouse in you an interest in the study of focal infections in relation to the etiology of toxemia.

## THE OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, MAY 7, 1931

DR. JACOB H. VASTINE read a paper entitled **The Rôle of Roentgenology in Obstetrics**, in which he presented a general review of this subject.

### DISCUSSION

DR. JOHN A. McGLINN.—An important matter is the routine examination of the chest of all infants before they are discharged from the hospital. I am absolutely convinced, from the number of cases I have seen, that the obstetrician has not fulfilled his whole duty if the thymus is not examined before the patient leaves the hospital, so that in the lateral view you may see whether there is pressure upon the trachea.

In a patient rather advanced in years, I did a section after she had had an unsuccessful attempt at labor, and got a living child perfectly formed. The x-ray showed no enlargement of the thymus. Three days later the child was reported dying: it was unquestionably a thymus case. The child was taken to the hospital, pictures were taken and treatment given immediately. Any number of cases of thymus deaths have come to my attention, which might have been avoided if the thymus had been examined before the patient left the hospital.

DR. LIDA STEWART COGILL reported a case of **Hydatidiform Mole With a Subsequent Negative Aschheim-Zondek Reaction**.

The anterior pituitary hormone in hydatid and chorionepithelioma is usually demonstrable for several months and when the urine gives a negative reaction we may assume that there is a cessation of chorion proliferation.

If this test proves to be as valuable a diagnostic and prognostic aid as Mack and Catherwood and other workers believe, it will mean the lessening of many needless operations in cases of hydatidiform mole and the giving to many patients another chance of having a fruitful pregnancy, provided, as stated by Sande, that hydatidiform mole has no effect upon subsequent fertility.

Mrs. B., aged twenty-six, gravida i, with strong maternal instinct and great desire for children, came to my office June 27, 1930 with the following history: She first menstruated at the age of twelve years, normally and regularly until four years later when she became anemic and had left inguinal pain after taking long hikes. No pelvic examination was ever made.

This pain continued up to time of her marriage in 1923. Four years later in 1927 menstruation became irregular and scanty, often going over a month, pain in left side continuing, this condition probably due to ovarian dysfunction from excess of anterior pituitary hormone. Last period April 17, 1930. Upon internal examination there was tenderness of left ovary with some enlargement, uterus corresponding in size to a two months' pregnancy.

Increase in size of uterus continued normally until September 12, when it gradually became smaller. Patient was never sure she had felt life. On November 7, 1930, she began having red discharge which continued for four days, never any amount of bleeding, some backache and feeling of weakness. She was sent into the maternity hospital and a mole was expelled with very little bleeding. The

patient complained of great weakness and faintness during uterine contractions, but made a very good recovery with the exception of large cystic ovaries which were exceedingly tender to touch.

No curettage was done after expulsion of hydatidiform mole, but two months later Dr. Charles Mazer did an Aschheim-Zondek test with a negative reaction.

#### DISCUSSION

DR. CHARLES MAZER.—The urine in cases of hydatidiform mole carries the anterior pituitary hormone in concentrated form so that the reaction in the infantile mouse ovaries can be obtained with one-fifth the quantity required in the diagnosis of normal pregnancy.

The Aschheim-Zondek test has a more important function in that diagnosis of chorionepithelioma may be made with a fair degree of certainty. The continued presence of anterior pituitary sex hormone two months after the expulsion of the mole may be regarded, according to the observations of most investigators, as evidence of the presence of chorionepithelioma. In the presence of clinical symptoms, a negative Aschheim-Zondek reaction should not be regarded as conclusive evidence against the presence of chorionepithelioma.

The disappearance of the Aschheim-Zondek reaction after extirpation of the uterus argues against the presence of metastasis. The test is therefore of great value both in the diagnosis and prognosis of chorionepithelioma.

#### DR. LIDA STEWART COGILL also reported a case of **Complete Spontaneous Rupture of Uterus in a Normal Breech Labor.**

Mrs. K., aged thirty, colored, gravida iv, para iii. Date of last menstruation and of quickening uncertain, probably due in November, 1928. Registered in prenatal clinic of Woman's College Hospital, May 29, 1928. Wassermann negative, cervical smear showed no evidence of gonorrhea, her previous three labors were normal.

Operation for right inguinal hernia in sixth month of this pregnancy, otherwise history negative. Entered hospital Jan. 6, 1928, stating she had slight pains for two days. Breech presentation, right sacral anterior position, cervix dilated  $1\frac{1}{2}$  fingers, no obliteration, membranes unruptured, pains slight and irregular, fetal heart good. One and a half ounces of castor oil given at noon, quinine sulphate gr. x with strychnia sulphate gr.  $\frac{1}{60}$ , repeated quinine sulphate gr. x in  $\frac{1}{2}$  hour. Pains became stronger, 4:30 P.M. membranes ruptured, breech on perineum at 4:45 P.M., patient having strong pains every three to five minutes.

Taken into delivery room at 4:50 P.M. and at 5 P.M. pains suddenly ceased and signs of ruptured uterus appeared, the baby was extracted, placenta found in abdominal cavity, very moderate external bleeding but signs of internal hemorrhage, vaginal packing was done and stimulating treatment administered, pulse rapid and irregular, baby was stillborn.

Patient sent to operating room, and upon opening abdomen the abdominal cavity was found filled with blood and clots. Rupture was found on the left side of uterus posterior to the broad ligament. The peritoneal coat was torn for a distance of 10 cm. above the cervix. The rupture was complete through all the coats of the uterus for a distance of 5 cm. and parallel with uterine artery. A panhysterectomy was done.

Microscopic examination showed a hyaline degeneration of the uterine muscles. Patient lived eighteen days, dying from septic pneumonia and peritonitis.

A complete spontaneous rupture of the uterus occurring during a normal labor is exceedingly rare and with history of previous normal labors one may not recognize the true condition at first. In this instance the physician who was supervising the case

with the intern did recognize what had occurred and at once started stimulating treatment and packed the vagina. The placenta was probably attached over the weakened area of the uterine wall and was expelled into the abdominal cavity. The breech remained fixed at outlet and was readily extracted.

**DR. FAITH S. FETTERMAN** presented a paper entitled **Referred Pain of Ureteral Origin.** (For original article see page 259.)

#### DISCUSSION

**DR. FLOYD E. KEENE.**—Several years ago, Mirabeau brought out the fact that dysmenorrhea not infrequently was of ureteral or renal origin, and I have seen several patients whose menstrual pain could undoubtedly be explained in this way.

I cannot emphasize too strongly the fact which Dr. Fetterman has brought out that one may easily confuse a lesion along the urinary tract with that of the pelvic organs, appendix, or gall bladder, and I am sure that many of us have been chagrined in removing a normal ovary or appendix when the lesion lay in the ureter or kidney.

This applies with particular emphasis in the diagnosis of the so-called chronic appendicitis. I never make this diagnosis until all other possibilities have been eliminated, particularly lesions of the ureter.

**DR. H. M. GINSBERG.**—I have always believed in the referred pain of the ureter. It has been our policy at the hospital to make a ureteral examination on all patients with obscure abdominal pain and if they also have pain radiating down the leg we feel sure that they have either a ureteritis or some form of obstruction in the ureter.

The fact that the symptoms of a ureteral stricture are often aggravated during the menses will often mislead. The exaggeration of symptoms is caused by the congestion of the pelvic organs at this time which naturally increases the degree of obstruction in the ureter.

As we make all our urograms by the pyeloscopic method and are able to see the exact size of the ureter under the fluoroscope it would be interesting to inject pituitrin as suggested by the speaker and see what effect it has on a dilated ureter.

# Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

## REVIEW OF NEW BOOKS

### GYNECOLOGY

Since the death of Reifferscheid, co-author of the first edition, Stoeckel has brought out two revisions of his book on gynecology.<sup>1</sup> This, the third, edition bears evidence of a critical review of the literature of the past three years and includes much new material. The illustrations are beautifully done, the sixty-five colored prints are superb and the type is easily read; this is in marked contrast to the flimsy binding which makes the handling of a book weighing five pounds rather tiresome.

Stoeckel goes rather deeply into the psychic factors of such neuro-gynecologic disorders as vaginismus. There is a good chapter on diseases of the bladder, yet no mention is made of the type of ulcer described by Hunner. And while some conditions of the ureter are discussed in scattered places, no mention of stricture of the ureter or its importance in pelvic differential diagnosis is made. Ectopic pregnancy is omitted, Stoeckel stating that it is an obstetric problem. The technic of the Baldy operation is incorrectly illustrated, page 313; the round ligament should be drawn through the broad ligament below the utero-ovarian ligament. Baldy stated that this point in the technic assisted in correcting accompanying prolapse of the ovary in cases of retroflexion. A statement in the text, accompanying the illustration in question, says the deeper the round ligaments are approximated the more the uterus will be elevated and anteфлекed. Experience shows that the lower the round ligaments are approximated on the posterior surface of the uterus, the greater the tendency for the fundus to again retroflex over the too low sling.

The section of ovulation and menstruation has been changed greatly. Here is a full presentation of recent conceptions of the interrelationship of the endocrine glands. While the work of some American anatomists and physiologists is quoted, it is evident that the pioneer work of Philip Smith, on the hypophysis, has been overlooked.

Stoeckel prefers vaginal hysterectomy in cervical carcinoma. He subjects his cases when operable, to a preliminary radium treatment, does a widespread vaginal hysterectomy and follows up with intensive roentgen-ray cross-fire. The chapter on radiation therapy in gynecology has been written by F. v. Mikulicz-Radecki.

Sterility is discussed in the same chapter with operations for sterilization, and there is included in this chapter a detailed discussion of contraceptive measures. A short chapter on diseases of the breast is included in the volume. The text is concluded with a pharmacopoeia, relating to gynecology, with a surprisingly large number of biologicals. How many of these organ extracts Stoeckel has found potent is not, however, stated. The book is a foremost example of a single volume text on gynecology.

—*Phillip F. Williams.*

<sup>1</sup>*Lehrbuch der Gynäkologie*, Dritte, Neubearbeitete Auflage. Von Prof. Dr. W. Stoeckel. S. Hirzel, Leipzig, 1931.



Liepmann<sup>2</sup> has arranged in a series of fifteen lectures a wealth of practical gynecology, which he terms a gynecologic seminar. He is partial to this form of writing, having previously offered obstetrics, psychology in women, operative obstetrics and operative gynecology in the same manner. Here he has drawn on the abundance of clinical material at his command, selecting cases, as necessary, to illustrate such points as his years of experience have shown to be of signal importance to the practitioner.

The text begins with enlargements of the uterus, and in succeeding lectures, or chapters, takes up tumors, displacements, anomalies of menstruation, infections and social gynecology. Under anomalies of menstruation are grouped for convenience both extruterine pregnancy and malignant newgrowths.

Two features stand out in the book. One is Liepmann's interest in the subject of psycho-organic interdependence in gynecology, on which he lays great stress. The other is the marked development of, and a broad-minded attitude toward, what he terms "Frauenkunde": in that, when studying and treating gynecologic patients, one must consider the whole of the body, the social relationships of her life and the pelvic organs not as a triad, but as a unity. This idea is developed throughout the book in hygiene of women, cancer prophylaxis, the abortion problem and the subject of birth control.

The interpolation of case histories and the frequent use of the personal pronoun lends an individual flavor to the text.

—Philip F. Williams.

#### OBSTETRICS

This report<sup>3</sup> on the *Still-Births and Neo-Natal Deaths in India* is a compilation of several researches.

The first part of the book is a discussion in the findings in 200 autopsies on stillbirths and infants dying at, or soon after, birth, and the related conditions of the mothers, as syphilis and toxemia, the placenta, and the complications of labor. It may be mentioned in passing that 17 of the mothers of this series died.

Of particular interest is the fact that caste and religious barriers did not hinder the investigation to a greater extent and, again, the fact that in a country where tropical diseases predominated, only 10 per cent of the deaths could be attributed to these diseases *per se*.

Malaria seems to have had little effect. One is surprised at the amount of "pernicious anemia of pregnancy"; this is a different entity from true pernicious anemia of this country. One learns that 35 per cent of the maternal mortality of India is caused by this disease, yet it does not seem to be a large cause of the stillbirths reported.

The second part of the book is a résumé of an All-India hospital questionnaire on stillbirths and neonatal deaths. The statistics show that complications of labor and acute maternal causes rate much higher than in England, while the rate for syphilis is obviously an understatement.

The third part of the book on conclusions and suggested preventive measures outlines an extensive program for education as to prenatal care among women, and a study of the relationship of diet, poverty, and malnutrition to fetal deaths and a further investigation of tropical diseases in pregnancy. A program for further education of medical students and midwives, postgraduate study, and the use of hospitals as teaching centers is suggested.

—Philip F. Williams.

<sup>2</sup>*Das Gynäkologische Seminar, Praktische Gynäkologie mit besonderer Berücksichtigung der sozialen Frauenkunde. In 15 Vorlesungen. Von Dr. Wilhelm Liepmann. Urban & Schwarzenberg, Berlin and Wien, 1931.*

<sup>3</sup>*Still-Birth and Neo-Natal Death in India: a Preliminary Enquiry. The Lady Irwin Research Fund. The Countess of Dufferin's Fund Council, By Christine J. Thomson. New Delhi; The Countess of Dufferin's Fund Council, London, Messrs. H. K. Lewis & Co., Ltd., 1931.*

To the second edition of Liepmann's *Obstetric Course on the Phantom*<sup>4</sup> a chapter on the Kielland forceps has been added. This book, with its excellent and simple illustrations, should prove of great value to the student and practitioner in acquiring technical facility. The author objects to the use of forceps for rotation. The treatise is detailed, admirably arranged, with a short, clear text.

—R. T. Frank.

#### RADIUM AND ROENTGEN RAYS

Jarcho, in Volume 13 of the Series of Monographic Atlases edited by Case, covers the subject of *Gynecological Roentgenology*.<sup>5</sup> The object of the series is to afford postgraduate work to the roentgenologist. The historical background of pneumoperitoneum and the injection of iodized oil, as well as tubal insufflation are adequately discussed. According to Jarcho, roentgenologic methods in gynecology afford information only as to the presence or absence of calcified fibroids. He might have added dermoid cysts which can be diagnosed by this method.

The technic, diagnosis, indications and contraindications, as well as the value of pneumoperitoneum are fully taken up. That skill and experience are needed for this procedure is emphasized as it might otherwise be both painful and not free from danger.

The aspects of uterosalpingography are likewise discussed in detail. Jarcho seems extremely partial to this method although I have seen unpleasant results of both recent and later appearance including permanent chronic inflammatory changes in the tube, localized retained particles of oil, as well as the occurrence of pelvic abscess. It is possible to combine both pneumoperitoneum and uterine salpingography in special cases. The tubal insufflation with air, oxygen or carbon dioxide is likewise fully described. Physiologic observations obtained on the uterus and tubes by means of these methods have proved of interest. A fairly complete review of radiation therapy in gynecology is appended.

The book is beautifully gotten up, with excellent illustrations, many case histories as well as description of apparatus and technic, so that it should prove of great value to the radiologist and radiotherapist. A large bibliography concludes this monograph which is to be highly recommended for those interested in this special field of gynecology in which the author has a large and varied personal experience.

—R. T. Frank.

Volume V of *Ergebnisse der medizinischen Strahlenforschung*<sup>6</sup> contains a large amount of material by numerous authors. The first subject discussed "Der Kaskadenmagen," by Regelsberger, manifests itself by a triad of symptoms including the roentgenologic picture, anacidity, and spastic obstipation. The condition is a vagotonic symptom.

Pansdorf next takes up "Experimental Roentgenologic Studies of the Small Intestine." Such studies were dependent on the introduction of the Rieder contrast meal. He finds that the combined fractional oral administration of the contrast fluid and filling of the last loop of the ileum by enema, aids in these studies. The coils of small intestine show a definite arrangement. They should

<sup>4</sup>*Der geburtshilfliche Phantomkurs.* By Dr. med. Wilhelm Liepmann, Zweite, vermehrte und verbesserte Auflage. Urban and Schwarzenberg, Berlin und Wien, 1931.

<sup>5</sup>*Gynecological Roentgenology. A Roentgen Atlas of the Female Generative Organs With Special Reference to Uterosalingography and an Outline of Gynecology in Its Relations to Roentgenology With Case Histories and a Chapter on Radium Therapy.* By Julius Jarcho. Annals of Roentgenology. Vol. 13. Paul B. Hoeber, Inc., New York, 1931.

<sup>6</sup>*Ergebnisse der medizinischen Strahlenforschung (Röntgendiagnostik, Röntgen-, Radium- und Lichttherapie).* Herausgegeben von H. Holfelder, H. Holt-husen, O. Jüngling, H. Martius, H. R. Schinz. Band V. Verlag von Georg Thieme, Leipzig, 1931.

empty in five to seven and one-half hours. By this method the effect of drugs, the rate of fat absorption with jodipin emulsion can be worked out.

Risse deals with the physical principles of photochemistry (light and x-ray). The genetic effect shows that in every case mutations are produced by x-ray and radium rays. These effects may produce pathologic symptoms, for which reason he warns against raying of the ovaries in order to induce temporary sterilization. The effects on cell division are described. Rays of all wave lengths appear to cause changes and the mutation is dependent upon the dose. He discusses questions which have not yet been fully clarified, including the wave length to be employed. Impregnation of cells, for example seeds with heavy metals, before the radiating, increases the mutations obtained. The further studies deal with dosage, variation of the chromosomes obtained, as well as somatic changes. The fact that the offsprings of radiated individuals are normal is accounted for by the almost inexhaustible reserves of different hereditary factors.

Baensch has described the radiation therapy of hypophyseal tumors. The experienced clinician will place much importance on an exact x-ray picture of the sella as well as the eye findings. Roentgen therapy is indicated if we are not dealing with cysts, endotheliomata or teratomata. However, the exact diagnosis will in most instances not be possible. Should the visual fields show progressive shrinkage, operative decompression is indicated. The best results are obtained in eosinophilic adenoma (acromegaly). In suprasellar tumor (dystrophia adiposa genitalis), headache and visual disturbance are frequently ameliorated. From these results he deduces that before operation is practiced, radiotherapy should be tried in the majority of instances.

Hildebrandt takes up the question of the advisability of treating malignant struma with radiotherapy. His material consists of 46 cases. In Bern, 1.04 per cent of all autopsies showed this condition, and of all goiters, malignancy was noted in 1 out of 11. The material at the Radiumhemmet showed only 13.6 per cent of cures, lasting 5 years by means of radium. At the Mayo Clinic, radium combined with surgery, showed 31 per cent of cures.

Halberstaedter and Simons treat the subject of skin cancer. In their opinion practically every early case of skin cancer is curable by means of radiotherapy. In advanced cases radiotherapy frequently is the sole remedy which promises cure. For these reasons radiotherapy appears at present to be the method of choice. Of importance is early recognition of the condition, technically unexceptionable method, and systematic follow-up over several years. In other words, the cure of skin cancer at the moment is primarily a problem in recognition.

Schinz and Uehlinger describe the diagnosis, prognosis and therapy of primary tumors and cysts of the bones. According to the authors, these tumors not only have their favorite site of location and age incidence, but are characterized by distinct rate of growth, type of metastases and radiosensitivity. In consequence of these characters, the method of treatment and prognosis can be outlined with considerable certainty as exceptions are unusual. Prognosis is determined by the biology of the growth. American statistics show that cure of osteogenetic sarcoma is poor no matter what method of treatment is employed. Primary radical treatment is contraindicated in osteodystrophia cystica juvenilis and in benign giant cell tumors.

Zwerg discusses radium surgery of cancer of the gastrointestinal tract, the female genitals and the breasts. Of the gynecologists, Wintz appears the only one who feels justified in using radiotherapy alone in even operable breast tumors. The author believes that surgery should be employed in operable cases unless special contraindications exist. The results with radiotherapy appear even more hopeless in gastrointestinal carcinoma. He therefore advises against the employment of any

but surgical measures except in carefully selected cases. A combination of surgery for the local insertion of radium needles in uterine cancer, is described. At present no uniform principles can be formulated in this field.

Friedrich and Schreiber, in the concluding contribution, discuss the principles underlying work with light divided by means of spectroscopic apparatus. The subject is too mathematical and technical to be described in this review.

On the whole, this volume contains an unusual number of important contributions, both for the radiotherapist and the general medical public.

—R. T. Frank.

#### ENDOCRINOLOGY

Zondek's monograph on the *Hormones of the Ovary and the Anterior Lobe of the Hypophysis*<sup>1</sup> includes all of his experimental work, both published and unpublished. The amount is stupendous. Practically all of his discoveries have stood the full test of time and repetition by others. The immense amount of material included cannot be reviewed in detail. Of especial importance are the implantation method, which he devised, and which put an almost microbiologic technic at the disposal of the investigator. He describes his method of preparing female sex hormone which he calls "folliculin."

An important portion of the book are the studies of the prepituitary hormone and its separation into what Zondek calls "Prolan A" and "Prolan B." Not all investigators are as yet willing to concur that these represent two distinct hormones although the most recent work is somewhat confirmatory of this conception. Innumerable experimental investigations have been performed covering rejuvenation, inhibition of ovulation, effects during pregnancy, hormonal sterilization, ovulation during pregnancy, and interruption of pregnancy. Studies on the concentration of both female sex hormone and prepituitary hormone during pregnancy have been made. Clinical investigations of so-called polyhormonal diseases are included. The clinical use of female sex hormone and Prolan are described. The concluding chapters deal with the Aschheim and Zondek test for pregnancy which has revolutionized our diagnostic methods.

No student of endocrinology, whether his interests are clinical or strictly biological, can afford to do without this unique monograph.

—R. T. Frank.

<sup>1</sup>*Die Hormone des Ovariums und des Hypophysenvorderlappens. Untersuchungen zur Biologie und Klinik der Weiblichen Genitalfunktion.* By Dr. Bernhard Zondek. Verlag von Julius Springer, Berlin, 1931.

# Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

## Selected Abstracts

### Physiology of Pregnancy

**Ogino, K.: Ovulation Time and Conception Time.** *Zentrabl. f. Gynäk.* 54: 464, 1930.

From material obtained in 118 laparotomies the author draws the following conclusions: the time of ovulation falls between the sixteenth and the twelfth day before the expected menses, and is independent of the length or irregularity of the menstrual cycle. It is incorrect to express the ovulation time in number of days after the beginning of the last menstruation.

Conception following intercourse is dependent on: time of ovulation, the length of time spermatozoa will live in the female genitals, and the length of time the ovum may be impregnated after ovulation. Various authors give the length of time sperm will survive in the female as four to eight days with the most acceptable figure as three days.

From case histories the author believes that the eight-day period which falls between the nineteenth and the twelfth days before the expected menstruation is the most fertile, that conception is seldom possible between the twenty-fourth to the twentieth days before the menses, and that it is impossible from the eleventh to the first day before the period.

WILLIAM F. MENGERT.

**Sfameni, P.: The Active or Vital Dilatation of the Uterus.** *Monitore Ostet. Ginec.* 1: 581, 1929.

Even at present the greatest majority of physicians believe in the old doctrine that the uterus during gestation enlarges as result of pressure exerted by the developing ovum within its cavity, that such passive distention becomes possible because of hypertrophy and hyperplasia of the uterine walls.

Over a century ago, Bertrandi and Meli have maintained that the uterine wall offers no resistance to the ovum and that consequently no active pressure is required for its distention. These same authors believed that the capability of active anatomic dilatation is acquired by the uterus only in pregnancy. Sfameni, however, thinks that this ability is present through all the various phases of uteroovarian functional activity, though the intensity of the individual vital phenomena varies, so that they are manifested only weakly in the nonpregnant but strongly in the pregnant phase of the cycle.

For the last twenty-five years the author has been convinced that the walls of the uterus may expand and thus transform its virtually only anatomic into a real cavity. This property, termed by him "active functional dilatation, or active diastole," has an important bearing on the phenomena of pregnancy, both in the normal and the abnormal conditions.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.



**Eufinger, H., et al.: The Reid Hunt Reaction in the Diagnosis of Pregnancy.** Arch. f. Gynäk. 136: 12, 1929.

Mice treated with serum from pregnant women showed a definite increase in the acetonitrile resistance. As pregnancy progresses, the Reid Hunt reaction becomes more and more positive. Patients suffering from hyperemesis gravidarum show no variation from the normal but those who are suffering from eclampsia and the late toxemias of pregnancy show markedly increased values. Parallel examinations of the fetal and maternal blood show marked variations. The umbilical cord blood practically always gives normal values. The authors conclude from their studies that pregnancy is practically always accompanied by a definite hyperthyroidism.

RALPH A. REIS.

**Dierks, K.: The Use of the Manoilloff Pregnancy Reaction.** Monatschr. f. Geburtsh. u. Gynäk. 87: 285, 1931.

The author maintains that the Manoilloff reaction is too unreliable for the detection of pregnancy during the early months. From the fourth month on it is a helpful but uncertain aid. The serum of pregnant women yields a positive reaction in 99.5 per cent of all the cases and the reaction is positive until the ninth day of the puerperium. In the presence of neoplasms such as carcinoma and myomas, the test is positive in about two-thirds of the cases. In all gynecologic cases other than those with neoplasms the reaction is negative. The test is negative when applied to liquor amnii.

J. P. GREENHILL.

**Nerson, H.: The Manoilloff Reaction for the Diagnosis of Pregnancy.** Bull. de la Soc. d' Obst. et de Gynéc. 1: 105, 1931.

The author employed the Manoilloff test for the detection of pregnancy in a small series of pregnant and nonpregnant individuals. He comes to the conclusion that the test is absolutely unreliable.

J. P. GREENHILL.

**Pfleiderer, A.: The Present Status of the Biologic Pregnancy Diagnosis and the Serologic Relationship between Parent and Child.** Monatschr. f. Geburtsh. u. Gynäk. 88: 1, 1931.

According to Pfleiderer, in spite of the enormous amount of work done on the physiologic and pathologic changes in pregnant and nonpregnant individuals and the biologic and chemical relationships between parent and child, no specific test has yet been evolved which will directly prove the presence of a fetus. The Aschheim-Zondek test which establishes the presence of a hormone from the anterior lobe of the hypophysis, indirectly indicates the presence of a fetus. This is the most reliable test up to the present time and far more certain than all the other reactions which depend upon changes in the ferments, colloids, ions or metabolism.

The Zangemeister photometer test which aims at the demonstration of a direct serologic relationship between parent and child is not dependable. It is therefore useless for forensic purposes. Hence the determination of the blood groupings remain the only useful serologic method of determining the paternity of a child in suitable cases.

J. P. GREENHILL.

Lassen: **Reliability of the Aschheim-Zondek Reaction.** Ugesk. f. laeger 92: 953, 1930.

Of 198 normal pregnancies examined, 194 gave positive reactions; of 9 extra-uterine pregnancies, 7 gave positive reactions; 1 hydatid mole gave a positive reaction; and of 114 varying conditions in women who were not pregnant, only 1 gave a positive reaction. Following parturition, of 11 patients examined, 2 were negative after only two days and 1 was positive after ten days. The causes for failure to obtain a positive reaction in a small percentage of pregnant women is discussed in detail.

The author points out the disagreement voiced by investigators as to the stability of a solution of hypophyseal hormone and reports an experience of his own. A urine which gave a positive reaction was preserved at a temperature of 2-3° C. for 148 days. After that time, using the same amounts as in the first test, a reaction was obtained which was as strongly positive as the original one.

REUBEN L. LARSON.

Bourg, R.: **A New Procedure in the Application of the Aschheim-Zondek Reaction.** Rev. franç. de gynéc. et d'obst. 26: 65, 1931.

The experience of this author with the Aschheim-Zondek test leads him to recommend that the test be carried out at the same time on a male and female rat each about one month old. These animals are more certain, more constant and more resistant than mice. The test when positive in rats manifests itself macroscopically by the presence of false corpora lutea in the ovary in the females, and by hypertrophy of the seminal vesicles in the males. The latter are more sensitive than females hence they yield the most reliable reactions, and a macroscopic examination is sufficient in the males.

J. P. GREENHILL.

Fanz, J. I., and Gault, E. S.: **Hydatidiform Mole as a Cause of Positive Reaction in the Aschheim-Zondek Pregnancy Test.** J. Lab. & Clin. Med. 16: 27, 1930.

The authors report a case of hydatidiform mole which gave a positive Aschheim-Zondek pregnancy test reaction. Inasmuch as there was no fetus, but merely chorion and decidua, the pituitary hyperfunction can be attributed only to one or both of these cell proliferates. The decidual proliferate of the uterus can hardly be regarded a producer of hormones in the pituitary since it is maternal tissue from the start, but it is probable that the anterior lobe of the hypophysis acts as a co-secreting organ to the growing placental proliferate (possibly Langhans' layer).

W. B. SERBIN.

Schultze-Rhonhof, F.: **Experiences With the Aschheim-Zondek Reaction, Especially in Hydatid Mole and Chorionepithelioma.** Zentralbl. f. Gynäk. 54: 578, 1930.

The author points out the possibility of using the test as a diagnostic aid in pregnancies in which the question of intrauterine fetal death arises. As a positive test is not found more than eight to ten days after death of the fetus, a negative reaction is definite evidence of intrauterine fetal death. However, a positive test is not definite evidence that the fetus is alive.

The test is of great value as a criterion of the completeness of a cure of mole or chorionepithelioma after spontaneous expulsion or operative removal.

In conclusion, the author discusses the question whether the placenta stores or secretes the hormone. In view of the relatively enormous amounts of the hormone found in cases of chorionepithelioma in which condition there is only trophoblastic tissue and no pregnancy, he believes the placenta must play a secretory rôle.

WILLIAM F. MENGERT.

**Ehrhardt, Karl:** Chorionepithelioma and the Pregnancy Reaction. *Zentralbl. f. Gynäk.* 54: 1538, 1930.

The value of the Aschheim-Zondek reaction as a diagnostic aid in cases of chorionepithelioma is stressed in this article. A case of malignant chorionepithelioma with metastases in brain, lung, liver, both kidneys, spleen, and left ovary, was observed for a period of six weeks and at every trial a positive test obtained with injection of only 1/80th to 1/100th of one c.c. of urine. This is about one tenth the quantity required in a case of normal pregnancy.

WILLIAM F. MENGERT.

**Fahlbusch, O.:** The Aschheim-Zondek Reaction Used as Indication for Operation in Chorionepithelioma. *Zentralbl. f. Gynäk.* 54: 1542, 1930.

A twenty-five-year-old woman, in whom histologic study of uterine curettings justified suspicion of chorionepithelioma, was watched. The Aschheim-Zondek reaction was consistently negative over a period of six months. Curettage apparently had removed all of the tumor. This case proves the great practical value of the Aschheim-Zondek reaction in instances of suspected chorionepithelioma. In spite of the histologic findings the author felt justified in conserving the uterus on the basis of the negative outcome of the hormonal tests. He knew that an early diagnosis would be made in the event of a recurrence and operative procedures could then be instituted.

WILLIAM F. MENGERT.

**Reeb, M.:** The Importance of the Biologic Reaction of Pregnancy (Aschheim-Zondek) for the Diagnosis and Prognosis of Hydatidiform Mole and Chorionepithelioma. *Bull. de la Soc. d'obst. et de gynec.* 1: 94, 1931.

Reeb maintains that 50 per cent of the cases of chorionepithelioma follow a hydatidiform mole, 25 per cent occur after an abortion and 25 per cent follow a normal pregnancy at term. He employed the Aschheim-Zondek test in two cases as an aid in the clinical and histologic diagnosis of malignancy. He urges that this test be employed in all doubtful cases. As a result of the use of this test many uteri which would otherwise be removed because of a suspicion of malignancy will be left undisturbed.

J. P. GREENHILL.

**Ginglinger, A.:** Early Diagnosis of a Chorionepithelioma by Means of the Aschheim-Zondek Reaction. *Bull. de la Soc. d'obst. et de gynec.* 1: 99, 1931.

The author reports a case of chorionepithelioma which was recognized very early by means of the Aschheim-Zondek test. The patient passed a hydatidiform mole in April and on July 15 examination revealed everything to be normal. The patient had had a normal menstrual period from July 4th to 8th. An Aschheim-Zondek test was performed as a matter of principle, and it was found to be positive. There were three possibilities to account for this, namely, pregnancy, remains of the hydatidiform mole and a chorionepithelioma. A curettage was

performed on August 5 and a chorionepithelioma was discovered. The uterus was extirpated and the malignant tumor found. Two months after the operation, an Aschheim-Zondek test was negative.

J. P. GREENHILL.

**Grier, G. W.: The Value of a Lateral View in the Diagnosis of Pregnancy. Radiology 14: 571, 1930.**

The author emphasizes the importance of x-ray in pregnancy and also the advantages of both anteroposterior and lateral views. The advantages of the lateral view are as follows: Better detail due to the fact that there is less tissue to penetrate, particularly noticeable in twin pregnancies where the abdomen is quite large. Fetal bones can be demonstrated earlier in the lateral than they can in anteroposterior views.

The lateral views are of more value early in pregnancy while in the latter months of pregnancy after the fetal head has dropped into the pelvis the detail is obscured by overlapping bones and therefore the anteroposterior view is preferable. The relation of the size of the fetal head to the pelvis is better demonstrated in the anteroposterior view.

In the recognition of a dead fetus repeated examinations (both views) have been quite valuable as a cessation of increase in the size of fetus can be demonstrated. Monstrosities have been shown in either views.

HERMAN M. MEYER.

**Gardner, J. A., and Gainsborough, H.: The Cholesterol Metabolism During Pregnancy. Lancet 216: 603, 1929.**

Hypercholesterolemia has been reported in subacute parenchymatous nephritis, diabetes, cholelithiasis, arteriosclerosis, pregnancy and other conditions. Its normal value has been given as a definite figure by many investigators. The authors found that the normal cholesterol content of plasma varied between wide limits, but that in a given healthy individual the plasma cholesterol tends to remain at a fairly constant level. From this it was deduced that the degree of hypercholesterolemia in a pregnant woman could be definitely determined only when her previous normal rate was known.

The patients used in this study came to the clinic at the same hour, although it was impractical to obtain the blood in the "fasting" condition. Specimens were taken at monthly intervals before parturition and once or twice during the confinement.

The results showed: (1) An increase in the free cholesterol of the plasma during the first 30 weeks of pregnancy; concurrently an ester cholesterol decrease for the same period; (2) after the thirtieth week these curves both gradually approach a normal ratio before or near the parturition; (3) the values of plasma cholesterol are generally normal in the first two weeks of the puerperium; (4) some cases show a definite total hypercholesterolemia in which the total cholesterol figures run roughly parallel to the free cholesterol value.

The authors conclude that there is a marked disturbance in the cholesterol metabolism with great changes in the free and the ester cholesterol of the plasma, but with only moderate change in the total cholesterol. They suggest that such changes might be associated with the differentiation of the fetal tissues, and growth of the fetal brain, or that they possibly might be produced as a protective reaction for the mother.

H. C. HESSELTINE.

**Malfatti and Burtcher: Changes in the Alkali Reserve of the Blood in Pregnancy, Labor and the Puerperium.** Arch. f. Gynäk. 143: 272, 1930.

There is a definite decrease in the alkali reserve of the blood during pregnancy which becomes more marked during labor. This decrease is greater in primiparae than in multiparae. The alkali reserve increases during the first four days postpartum but does not reach normal values. Lactation again decreases the alkali reserve of the blood and twelve to twenty-one days postpartum the carbon dioxide combining power of the blood is not yet back to normal. Puerperal infections result in a decrease of the alkali reserve greater than average. Hyperemesis gravidarum and the kidney of pregnancy show an abnormal decrease in alkali reserve, i.e., more of a decrease than is normal for pregnancy in a healthy woman.

RALPH A. REIS.

**Siedentopf and Eissner: Blood Reaction During Early Pregnancy and the Puerperium.** Ztschr. f. Geburtsh. u. Gynäk. 97: 17, 1930.

In a previous paper the authors have shown conclusively that there is a decrease in the hydrogen-ion concentration of the blood during the last months of pregnancy. With that in mind, they examined the blood of 21 women during the early months of pregnancy, and 28 during the puerperium.

Their conclusions are: (1) Even early in pregnancy, there is a definite decrease in the hydrogen-ion content. (2) The same is true in the puerperium, but the  $P_H$  of the blood becomes normal five to eight days postpartum. (3) During labor there is an acidosis due to the muscular activity.

LESTER E. FRANKENTHAL, JR.

**Bok, A.: The Ammonia Content of the Blood in Pregnancy, Its Source and Its Function as Controllor of the Reaction of the Blood.** Arch. f. Gynäk. 140: 11, 1930.

The ammonia present in the blood is known to control the neutrality of the blood and thus prevent hyperacidity or hyperalkalinity but there has never been available any precise method of measuring its concentration. Bok elaborating on the technic of Ellinghaus, studied 120 women throughout pregnancy. He finds that ammonia, as such, is found in the blood of healthy nonpregnant women, the average amount being 0.293 mg. per 100 c.c. of blood. During the first half of pregnancy, there is practically no change in concentration, the average present being 0.314 mg. During the second half of pregnancy there is a definite rise to 0.501 mg. There is a decrease postpartum but the amount present is still above normal on the fifth day, 0.347 mg. The ammonia was found to be markedly increased in the 8 cases of toxemia of pregnancy which were investigated (0.648) but was not higher in true eclampsia than in the other forms of toxemia.

In an effort to determine the source of the ammonia, samples of blood were drawn and allowed to stand twenty-four hours before being analyzed. The results then were much higher, normal controls being 2.023, first half of pregnancy 2.081, last half of pregnancy, 1.587, second stage of labor 1.707, puerperium 1.717, eclampsia 1.348. Apparently, therefore, the blood in late pregnancy, labor and the puerperium contains progressively less of the ammonia "mother substance."

RALPH A. REIS.